DETAILED SPECIFICATIONS AND CONTRACT DOCUMENTS
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS TO SUPPORT SINOVA GLOBAL
CITY OF TIPTONVILLE
LAKE COUNTY, TN

Cliff Berry, Mayor
Fran Hearn, City Clerk / City Recorder

May 9, 2022

Joel B. Spaulding & Company, inc.

CONSULTING ENGINEERS

3322 West End Avenue, Suite 106, Nashville, TN 37203
(615) 255-7766 | info@joelbspaulding.com
www.joelbspaulding.com

DETAILED SPECIFICATIONS AND CONTRACT DOCUMENTS
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

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* AIA FORMS ARE ACCEPTABLE

Advertisement for Bids
Contract 122 – DRA Water System Improvements to Support Sinova Global
City of Tiptonville, TN (Owner)
130 S. Court St., Tiptonville, TN 38079

Separate sealed BIDS for Contract 122 – DRA Water System Improvements to Support Sinova Global including installation of a 250,000 gallon elevated storage tank, 4,020 L.F. of 12" C-900 PVC Water Main, water pump replacement, and other site and utility work, will be received by the City of Tiptonville at City Hall at 130 S. Court St., Tiptonville, TN 38079 until 1:30 pm CST, June 9, 2022 and then at said office publicly opened and read aloud.

The CONTRACT DOCUMENTS may be examined at the following:

JOEL B. SPAULDING & COMPANY, INC. – CONSULTING ENGINEERS
3322 West End Ave., Ste. 106
Nashville, TN 37203
615-255-7766

Copies may be requested from the office of JOEL B. SPAULDING & COMPANY, INC. – CONSULTING ENGINEERS, by mail, email at bruce@joelbspaulding.com (recommended) or by phone at 615-255-7766. Electronic (PDF) copies of the Contract Documents are available for download at no charge. Please provide all contact information when requesting the Contract Documents.

No bidder may withdraw his bid within 60 days after the actual opening date of the opening thereof.

May 9, 2022

Cliff Berry, Mayor
City of Tiptonville, TN

Information for Bidders
Contract 122 – DRA Water System Improvements to Support Sinova Global
City of Tiptonville, TN (Owner)
130 S. Court Street, Tiptonville, TN 38079

Separate sealed BIDS for Contract 122 – DRA Water System Improvements to Support Sinova Global will be received by the City of Tiptonville at City Hall, 130 S. Court St., Tiptonville, TN 38079 at 1:30 PM CST, June 9, 2022, and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to the City of Tiptonville, 130 S. Court St., Tiptonville, TN 38079. Each sealed envelope containing a BID must be plainly marked on the outside as BID FOR CONTRACT 122 and the envelope should bear the BIDDER's name, address, Tennessee Contractor's License Number, classification, expiration date, bonding capacity, and any and all other applicable information as may be required under prevailing Tennessee Law. If forwarded by mail or other type delivery service, the sealed envelope containing the BID must be enclosed in another envelope addressed to the Owner at the address shown above.

All BIDS must be submitted on the BID PROPOSAL FORM. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for opening of the BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within 60 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified 60-day period, the time may be extended by mutual agreement between the OWNER and BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities shown in the BID schedule by examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve the contractor from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID bond payable to the OWNER for 5% of the total amount of the bid. As soon as the BID prices have been compared, the OWNER will return the BONDS of the all but the three lowest responsible BIDDERS. When the Agreement is executed the bonds of the two remaining successful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the payment BOND and performance BOND have been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A performance BOND and payment BOND each in the amount of 100% of the CONTRACT PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign BID BONDS or performance BOND and payment BOND must file with each BOND a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the performance BOND and payment BOND within ten (10) calendar days from the date when the NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary AGREEMENT and BOND forms, if forms other than industry standard (i.e., AIA or similar) are required. In case of failure of the BIDDER to execute the Agreement, the OWNER may consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within ten (10) days of receipt of acceptable performance BOND, payment BOND, and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by WRITTEN NOTICE withdraw the signed agreement. Such notice of withdrawal shall be effective upon the receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within sixty (60) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the sixty (60) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as deemed necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the work contemplated therein.

A conditional or qualified BID will not be accepted.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of and BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to its BID.

The low BIDDER shall supply the names and addresses of major materials SUPPLIERS and SUBCONTRACTORS when required to do so by the OWNER.

The ENGINEER is JOEL B. SPAULDING & COMPANY, INC., 3322 West End Avenue, Suite 106, Nashville, TN 37203.

GENERAL SCOPE AND SPECIAL PROVISIONS
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

1.00 SCOPE OF THE WORK

The work to be accomplished under these specifications consists of furnishing of all labor, materials, equipment and services necessary for the construction of:

Contract 122 – DRA Water System Improvements to Support Sinova Global

2.00 QUALIFICATIONS

All bidders must be licensed Tennessee Contractors and qualified for the type of project being bid upon. Bidder must be able to demonstrate specialized experience and technical expertise relating to the type of services to be provided and the ready availability of qualified and experienced personnel capable of completing the work within the time specified. The Consulting Engineer shall be considered the sole judge of the bidder's qualifications and their decision will be final. The Owner reserves the right to reject any and all proposals, to waive any informality, irregularity, mistake, error or omission in any proposals received and to accept the proposal deemed most favorable to the Owners interest as determined by the Engineer and Owner.

The intent of the specific language used in these specifications is not to disqualify an otherwise qualified bidder, but to promote and protect the Owner's interests as regards the finished project. The Engineer reserves the right to use reasonable and sensible judgement to weigh these exceptions against the dollar amounts of bids received in determining the proposal most favorable to the Owner's interest. In the event that a prospective Bidder finds it necessary to take exception to the portions of these specifications found in the minutiae, specifically, any overly precise language, or trivial detail that may be too narrow, or too broad, or too restrictive, or not restrictive enough, which inadvertently skews competition and/or causes unfair advantage to any bidder, the Bidder may request that the Engineer allow the Bidder to take exception by noting same at any time prior to Contract Award.

3.00 PRE-BID

For the bid proceedings, the provisions in the "Information for Bidders" shall be strictly adhered to by all parties. The CONTRACT DOCUMENTS including all addenda and the information contained in the bid package contain the provisions required for the construction of the PROJECT.

After the BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or the nature of WORK to be done.

Questions relative to the WORK shall be submitted to the ENGINEER; ENGINEER will respond promptly. All questions raised by any BIDDER and ENGINEER's subsequent response will be available to each BIDDER upon request. Inquiries shall be submitted during normal business hours to:

Bruce Spaulding, PE
Joel B. Spaulding & Company, Inc.
3322 West End Avenue, Suite 106
Nashville, TN 37203
Email: bruce@joelbspaulding.com

The officers and all employees of the City of Tiptonville have been instructed to have NO CONTACT written, verbal, or otherwise with any BIDDER concerning this contract or the work involved other than to assist in the identification of the sites in the field. The BIDDERS are requested to honor this instruction.

Failure to comply with the above instructions is a basis for rendering BID non-responsive.

4.00 DISCREPANCY OF STATEMENTS

The Contractor shall clarify any discrepancies found in the Plans, Specifications, and Contract Documents with the Engineer prior to the bid letting. After contract award, discrepancies noted are solely subject to the interpretation of the Engineer. Generally, the most restrictive condition will apply.

5.00 DRUG FREE WORKPLACE CERTIFICATION – TENN. CODE ANN. § 50-9-113

A written affidavit regarding a Drug Free Workplace Program in conformance with Tenn. Code Ann. § 50-9-113 will be submitted by the Contractor with the Bid and the Construction Contract.

6.00 IRAN DIVESTMENT ACT CERTIFICATION – TENN. CODE ANN. § 12-12-111

Each bidder must submit, with its bid, either a completed “Bidder’s Certification of Compliance with Iran Divestment Act” or the alternative statement and information required by Tenn. Code Ann. § 12-12-111.

7.00 SUBCONTRACTORS

In conformance with Tenn. Code Ann. § 62-6-199(b), all bidders are hereby notified that the name, license number, expiration date, and license classification of any subcontractor applying to the bid for electrical, plumbing, or HVAC work shall appear on the outside of the bid envelope. otherwise, the bid shall not be opened or considered.

8.00 EXECUTION OF CONTRACTS

The construction contracts and bonds shall be executed within the time specified in the Proposal and in at least three (3) originals.

9.00 BONDS AND INSURANCE

Each Bidder will provide a 5% Bid Bond. The Contractor will provide (4) original Performance and Payment Bonds in 100% of the amount of the Contract.

The Contractor will provide the following insurance coverage and will supply certificates of insurance in the executed contract documents for the following:

Comprehensive General Liability	
Bodily Injury & Property Damage	$2,000,000 per occurrence
Bodily Injury & Property Damage	$2,000,000 aggregate
Automobile	
Bodily Injury & Property Damage	$1,000,000 per occurrence
Workers Compensation – Employers Liability Limits	
Bodily Injury by Accident	$100,000 each accident
Bodily Injury by Disease	$500,000 Policy Limit
Bodily Injury by Disease	$100,000 Each Employee

10.00 EXECUTION, COORDINATION, SCHEDULE, AND PROGRESS OF THE WORK

The Contractor shall commence work under this contract within 21 days of "Notice to Proceed" issued for each bid schedule and shall fully complete the work described on each bid schedule within the consecutive calendar days shown below.

Contract 122: 270 Consecutive Calendar Days

The Contractor shall be required to furnish for approval and keep current a suitable progress chart or schedule showing the estimated and actual progress on the contract.

The Contractor will be charged liquidated damages in the sum of $200.00 for each consecutive calendar day thereafter for breach of contract.

TIME IS OF THE ESSENCE OF THIS CONTRACT and the Contractor is required to pursue the work continuously upon mobilization during normal work days and hours without delays, absences, postponements, temporary abandonment of the project for other work, removal of necessary equipment prior to completion, of failure to provide adequate manpower or necessary equipment.

Abandonment of the work constitutes breach of contract.

11.00 OBSTRUCTIONS

The scope of the Construction Drawings does not include an exhaustive identification of all obstacles which may be encountered during installation of the proposed facilities.

The Contractor shall follow the provisions of Tenn. Code Ann. § 65-31-101 et seq.,: "Underground Utility Damage Prevention Act" to the letter in order to identify underground facilities in the vicinity of the work. All work in the vicinity of any unidentified obstacles or underground facilities shall cease until the ownership, location, and nature of the obstacle is determined. The Contractor shall fully indemnify the Owner and Engineer for any damages resulting from non-compliance with Tenn. Code Ann. § 65-31-101 et seq. and this portion of the specifications.

In cases where other water lines, gas lines, sanitary sewer lines, storm sewer lines, telephone lines, power lines or other underground structures are encountered, they shall not be displaced or molested. Whether molested by accident or necessity the damage shall be remedied to original condition or better and as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense.

12.00 ACCESS TO AND INSPECTION OF WORK

Representatives of the City of Tiptonville and Joel B. Spaulding & Company, Inc. Consulting Engineers shall have at all times full access to records and physical facilities for inspection of the work and of all materials intended for use in the work, as well as to plants where such materials are produced and the Contractor shall provide facilities for such access and inspection.

13.00 FIELD SUPERVISION

The Contractor shall designate to the project at least one full time on-site responsible representative who can officially receive instructions from the Engineer. All special equipment or materials shall be installed under the supervision of a qualified installation engineer and/or representative furnished by the manufacturer of such equipment or materials.

14.00 APPLICATION FOR PAYMENTS

Five Percent (5%) retainage will be withheld for the entire duration of the Contract until all Contract Conditions are met, including the submittal of all reports, data, cleanup activities, etc.

To ensure timely payment of partial requests, the Contractor shall confirm each day all quantities for payment with the owner.

15.00 GUARANTEE

The Contractor shall guarantee all work and materials for a minimum period of one year after the date of beneficial occupancy as established by the Engineer.

16.00 PERMITS

The City of Tiptonville shall acquire all applicable TDEC Division of Water Resources permits prior to construction.

--- END OF SECTION ---

MULTI-COLUMN ELEVATED WATER STORAGE TANK
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

PART 1 – GENERAL SCOPE

1.01 DESCRIPTION OF WORK

A. The work to be performed under this section consists of the furnishing of all materials, tools, equipment, labor and incidentals necessary for the design, manufacture, delivery, erection, painting, disinfection and testing of a multi-column elevated storage tank. The tank is to be complete with all accessories specified herein, and is to be erected on foundations to be designed and constructed by the Tank Contractor. The tank shall meet all requirements of AWWA D100-11 Standard for Welded Carbon Steel Tanks for Water Storage.

B. The contracting company shall own their fabrication facilities. Divided responsibilities between erection and fabrication will not be allowed.

C. A qualified supervisor employed by the Contractor shall be on site at all times during construction of the steel support structure and water tank.

D. The Contractor shall have completed the design, construction, and commissioning of at least ten (10) multi-column elevated tanks with an equal style and design that have been completed within the last five years.

1.02 SUBMITTALS

A. Each bidder shall submit with their proposal a design sketch of the tank and foundation they propose to furnish. The general plan of the structure must show all major dimensions including the tank diameter, the height to low and high water levels, the sizes of all principal and secondary members, thickness of all plates, arrangement of members, and size of the tank foundation, including approximate quantities of concrete and rebar.

B. The successful bidder must submit shop drawings for all proposed work to include the tank foundation, concrete mix design, tank structure showing plate thicknesses, members, details of all connections, special details and member loads, piping, valves, painting and other pertinent information as required per the project plans and specifications. These drawings shall be sealed by a registered Professional Engineer in the State of Tennessee.

PART 2 – FOUNDATIONS

2.01 FOUNDATION DESIGN

A. Foundation design shall be based on the recommendations provided in the Geotechnical Report. The Owner shall retain the services of a testing firm to confirm that the design conditions are in conformance with design recommendations. The design of the foundation shall be in accordance with the

requirements of ACI 301, ACI 318, and the Geotechnical Report. Minimum concrete compressive strength shall be 3,000 psi at 28 days.

2.02 TANK FOUNDATIONS

A. The Tank Contractor shall furnish and install all materials, labor, and equipment necessary to complete the tank foundation, complete with anchor bolts, reinforcing steel, and concrete.

B. The Tank Contractor shall design and prepare construction plans and details for the foundations in accordance with the requirements of the specifications. The foundation construction drawings shall be sealed by a registered Professional Engineer in the State of Tennessee and submitted to the Engineer for review and final approval.

C. All testing of materials concerning the foundations shall be performed by an independent testing laboratory satisfactory to the Engineer.

PART 3 – TANK DESIGN AND MATERIALS

3.01 GOVERNING SPECIFICATIONS

A. Material, design, welding, shop fabrication, erection, testing, and inspection of the proposed elevated water storage tank shall be in compliance with the latest revision of AWWA D100 for "Welded Carbon Steel Tanks for Water Storage" and ACI 318.

B. The multi-column elevated tank shall consist of the following components: foundation, welded steel support tower, and a welded steel water tank. The elevated tank shall be in accordance with the shape, dimensions, and details required by these specifications.

C. The following design parameters shall apply, and the structure shall safely withstand the following loads acting separately or in combination:

1. Weight of the structure.
2. Weight of the water in the tank.
3. The structure shall be designed to withstand wind velocities in accordance with AWWA D100-11.
4. Seismic design in accordance with AWWA D100-11.
5. Snow load in accordance with AWWA D100-11.
6. Minimum thickness of plates in contact with water: 1/4 inch.

D. All steel in the structure shall be manufactured, rolled, or shaped in accordance with AWWA D100-11.

3.02 ELEVATED STORAGE TANK

A. Preference shall be given to designs of good appearance, with operating characteristics which give a constant pressure on the mains, as is consistent with the manufacturer's standards and economics of design.

1. The tank shall have a capacity of 250,000 gallons.

2. The tank shall have an operating head range of 28' – 4" feet between low and high water levels, ± 2.5 feet.

3. The high water level (HWL) shall be 141' from TOC with an elevation of 447 feet.

3.03 ACCESSORIES

A. Steel Riser (AWWA D100-11, Sec. 4.4.1): The center riser for the elevated tank shall be water-bearing and not less than 60 inches in diameter.

B. Riser Manway (AWWA D100-11, Sec. 5.4.4): The riser shall have a hinged manway not less than 24 inches in diameter. The manway shall be located approximately 36 inches above the riser baseplate.

C. Riser Safety Grate (AWWA D100-11, Sec. 5.1.1): The top of the riser shall be equipped with a safety grate unless a riser handrail is specified.

D. Shell Manway (AWWA D100-11, Sec. 5.4.3.2): The tank shell shall have a manway not less than 24 inches in diameter. The manway lid shall be supported with a hinged davit arm that is welded to the tank shell. The manway shall be located approximately 30 inches above the balcony floor.

E. Roof Hatch (AWWA D100-11, Sec. 5.4.3): Provide one 24 inch diameter weatherproof steel roof hatch, above the HWL, for egress into the tank. The hatch shall have a minimum 4 inch curb height and the lid shall overlap the curb 2 inches. The lid shall be watertight and lockable.

F. Balcony (AWWA D100-11, Sec. 4.4.4 & 4.4.4.2): The tank shall be provided with a balcony at least 24 inches in width and with a handrail of no less than 42 inches in height. The floor plate shall be at least 1/4 inch steel, perforated for drainage.

G. Freeze Proof Tank Vent (AWWA D100-11, Sec. 5.5): The tank vent should be sized for needed venting capacity for maximum inflow or outflow considering a main break at the base of the tank. The overflow pipe shall not be considered a tank vent. The vent will be designed to prevent the ingress of birds, insects, or

animals, and minimize condensation on the underside of the roof. There should be provisions in the vent design to release differential pressures caused by clogging of the bronze mesh non-corrodible vent screen.

The vent shall be designed to allow the attachment of an exhaust fan for ventilation during painting.

H. Ladders (AWWA D100-11, Sec. 5.4.2): Ladders shall have side rails not less than 2 inches x 3/8 inch, with a spacing between the side rails of not less than 16 inches and rungs not less than 3/4 inch round or square, spaced 12 inches on center. Ladders shall not, in any place, have a backward slope.

All ladders and safety devices shall comply with OSHA Standards. Two climbing belts and clamp assemblies approved by OSHA will be provided.

The tank shall be provided with steel ladders at the following locations:

1. A ladder shall be provided on one column of the tower, extending from approximately 10 feet above the foundation and terminating at the balcony railing. Furnish and install locking aluminum ladder guard.
2. A ladder shall be provided from the balcony to the roof manway and near other roof accessories.
3. A ladder shall be provided at the roof manway, extending to the bottom of the tank.
4. A ladder shall be provided at the shell manway, extending to the bottom of the tank.
5. A ladder shall be provided on the interior of the riser, starting 36 inches above the base of the riser and extending to the top of the riser.

I. Inlet/Outlet Piping (AWWA D100-11, Sec. 5.2.2): Provide a 12" diameter combined inlet/outlet pipe made of carbon steel (Sch. STD) that extends from the top flange of the base elbow and terminates 12 to 18 inches above the base of the riser. The inlet/outlet pipe shall be equipped with a protective cap to prevent entry of foreign materials dropping from above.

J. Overflow Pipe (AWWA D100-11, Sec. 5.3): The carbon steel overflow pipe (Sch. 20) shall be designed for a maximum fill rate of 1,500 GPM, with a maximum water level of not more than 6 inches above the weir. The overflow shall originate at the top in a weir box and terminate near grade, then connect to a 12" DIP leading to a concrete headwall/flap gate structure as shown on the drawings. The discharge point of the overflow shall have a removable #12 mesh stainless steel screen.

K. A bronze tank identification plate shall be mounted above the riser manway. The identification plate shall contain the following information:

1. Tank contractor's name
2. Year erected
3. Tank capacity in U.S. gallons
4. Tank head range
5. Tank style
6. Contractor's serial number or project number
7. Tank contractor's erection foreman

PART 4 – TANK AND SUPPORT STRUCTURE CONSTRUCTION

4.01 ERECTION OF TANK

A. All parts forming the structure shall be built in accordance with approved drawings. Welding procedures and general welding requirements shall be in accordance with AWWA D100-11, Sections 8 and 10. Welding shall only be performed by ASME qualified welders. Records of these qualification tests shall be available to the Engineer. The work at all times shall be open to the Engineer or their representative.

B. Roof Lap Joints: All interior roof lap joints and roof penetrations shall be sealed by means of continuous caulking.

C. Upon completion of the tank erection, the Tank Contractor will remove or dispose of all rubbish and other unsightly material caused by its operation, and will leave the premises in good appearance.

4.02 TESTING

A. After tank construction has been completed and the tank painted, the tank shall be hydrostatically tested by filling it with water to be furnished by the Owner. Any leaks shall be repaired and the structure made watertight. No repair work will be done on any point unless the water level in the tank is at least two feet below the joint being repaired.

B. In addition, the Tank Contractor shall test the weld joints by means of radiographic testing. All testing shall be done in accordance with AWWA D100-11, Section 11. The radiographic film test results will become the property of the Owner.

PART 5 – TEST AND DISINFECTION

A. The structure will be tested by filling the tank with water and any leaks or defects which may appear will be repaired. Prior to acceptance, Contractor shall disinfect the tank in accordance with AWWA C-652 Method 3.

B. After disinfecting the tank and returning the chlorine residual to normal, two bacteriological tests shall be taken 24 hours apart. Both tests must come back non-detectable.

PART 6 – SAFETY

A. The Contractor shall strictly comply with all applicable statutes, regulations, orders, rules, requirements and standards of all governmental authorities having jurisdiction with respect to the project, including without limitation, federal, state, and local OSHA and health regulations as well as the latest professional practices.

B. The Contractor shall, at its own expense, protect its employees and other persons from risk of injury, bodily harm, or death arising out of or in any way connected with work preformed.

C. Prior to commencing work, all personnel on the jobsite will have a minimum ten (10) hours of OSHA safety training or equivalent training within the previous year.

PART 7 – GUARANTEE

A. The Contractor shall guarantee the structure against any defects in coating application, material, or workmanship for a period of three (3) years from the date of substantial completion. If any defect is discovered and reported to the Contractor during the guarantee period, the Contractor shall make the necessary repairs without charge to the Owner.

FIELD PAINTING SPECIFICATION FOR 250,000 GAL ELEVATED TANK
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

PART 1 – GENERAL INFORMATION

1.01 GENERAL

A. This specification covers preparation of surfaces, performance, and completion of painting of all interior and exterior surfaces as required by the drawings and as specified herein. Exterior surfaces have been tested and found NOT to be lead Based. See attachment.

B. All Materials delivered to job site shall be in original sealed and labeled containers of the paint manufacturer.

C. All Materials used in contact with Potable Water must be approved in writing by the NSF/ANSI and by the respective State Authority.

1.02 ENVIRONMENTAL CONDITIONS

A. Coatings shall be applied during good painting weather. Air and surface temperatures shall be within limits prescribed by the manufacture for the coating being applied and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials specified herein are manufactured by the TNEMEC Co., Inc., North Kansas City, Missouri (Local Contact 615-333-1000) and are approved for use on this project.

B. Equivalent materials of other manufacturers may be substituted on approval of the engineer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information, and evidence of satisfactory past performance on water tanks. Submittals shall include the following performance data as certified by a qualified testing laboratory:

1. ASTM B117 - Method of Salt Spray (Fog) Testing
2. ASTM D 4587 QUV Exposure
3. ASTM 4585 - Practice for Testing the Water Resistance of Coatings Using Controlled Condensation
4. ASTM D4541 - Method for Pull-Off Strength of Coats Using Portable Adhesion Testers
5. ASTM D4060 - Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
6. ASTM D3363 - Method for Film Hardness by Pencil Test
7. ASTM D 870 - Water Resistance of Coatings Using Water Immersion

8. TTM-103 Test for galvanic measurement of zinc rich coatings
9. AWWA D102 - Standard for Painting Steel Water Storage Tanks
10. SSPC-SP10 - Near White Blast Cleaning
11. SSPC-SP6 – Commercial Blast Cleaning
12. SSPC PA2- Procedure for determining Conformance to Dry Coating Thickness Requirements.

C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the engineer at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.

D. Materials supplied by other manufacturers may be considered for substitution if the following prevailing conditions exist:

1. Performance criteria of the specified materials are exceeded by the submitted alternate materials as listed in paragraph 2.01 and detailed on the technical data sheets of each specified product.

2. The submittal must compare the performance criteria of the specified material with that of the submitted material and be documented in a side-by-side manner for the Engineer\Owner to review.

3. Substitute materials must be for complete systems and not individual products combined with the specified materials and the performance criteria for all products within a system must meet or exceed the specified materials.

4. Only one alternate submittal will be received for this specification and must be accompanied by a detailed statement of the sum to be added or deducted from the base bid should alternate materials be accepted.

2.02 COLORS

A. Colors, where not specified, shall be as selected by the Owner\Engineer.

B. All coatings utilized shall be certified "non-lead" as defined in Part 1303 of the Consumer Product Safety Act.B. All interior and exterior paint colors shall be certified to be lead free.

2.03 GUARANTEE

A. The contractor shall guarantee his work for a period of one year to the extent that he shall repair any defects due to faulty workmanship or materials which may appear on the structure during this period.

B. A first anniversary inspection shall be conducted in accordance with Section A.10 of AWWA D 102-11

PART 3 – METHODS

3.01 APPLICATION

A. Materials shall be mixed, thinned, and applied according to the manufacturer's printed instructions and in accordance with the latest edition of AWWA D 102.

B. Prepare surfaces in accordance with coating system's specifications. Touch up welds, burned and abraded areas with specified primer before applying field coats.

C. Allow each coat to dry thoroughly before applying next coat. Provide adequate ventilation for tank interior to carry off solvents during drying phase.

D. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags or missed areas.

E. Allow a minimum of seven days curing after application of final coat to tank interior before flushing, sterilizing of filling with water. Consult manufacturer data sheet for specific times at given temperatures.

F. Ventilation for the interior coating shall be in accordance with AWWA Specification D-102-11 Section A.7.6 and in accordance with directions of the Owner\Engineer. Ventilation is to be maintained on a continuous 24 hour per day basis beginning with the initial application of the interior primer coat plus a minimum of 48 hours after completion of the interior painting.

3.02 ACCEPTANCE OF WORK

A. All surface preparation shall be approved by the engineer/owner before primer is applied.

B. Request acceptance of each coat before applying next coat.

C. Correct work that is not acceptable and request re-inspection.

D. Contractor shall provide access equipment and necessary inspection equipment including, but not limited to: Dry Film Thickness Gauge, Surface Profile Micrometer and Tape, Surface Thermometers and Holiday tester for the Owner/Engineer or their authorized representative to inspect all surfaces during any phase of the painting operation.

3.03 FIELD QUALITY CONTROL

A. Inspector's Services:
   1. Documents:
      a. Review Contract Documents and applicable sections of referenced standards.
   2. Field Painting Inspection:
      a. Verify cleaning operations to surfaces are to condition specified.
      b. Verify conformance to paint specification per SSPC PA2
      c. Check for thickness of each coating, final thickness and holidays.
      d. Check touch-up for final finish.
      e. Contractor will have both wet and dry film gauges onsite for inspector's use.
      f. Document daily weather data including but not limited to ambient temperature, surface temperature, dew point, and relative humidity
   3. Reports:
      a. Submit written progress reports describing inspections made and showing action taken to correct non-conforming work. Report uncorrected deviations from Contract Documents.

B. Manufacturer's Service:
   1. A representative of the paint manufacturer shall be available to provide on-site technical assistance, and guidance for application of the paint system as needed.

3.04 PROTECTION

A. Protect painted areas against damage until paint system is fully cured

3.05 WASTE MANAGEMENT

A. General Requirements:

   1. Remove and dispose of, in a legal manner, all rubbish or other unsightly material leaving the premises in pre-project condition.
   2. Place materials defined as hazardous or toxic waste in designated containers.
   3. Containment as required shall be in accordance with SSPC-Guide 6 (CON), Guide for Containing Debris Generated During Paint Removal Operations.

3.06 ONE YEAR ANNIVERSARY INSPECTION

A. Owner shall set a date for a one-year inspection.

B. Inspection will be attended by an owner's representative, engineer, and painting contractor.

C. Any deficiencies in the coatings system will be repaired at the contractor's expense

3.07 STERILIZATION

A. The in accordance with the requirements of the State Health Department and ANSI / AWWA C652-02.

B. Bacteriological samples shall be taken and sent to the Health Department for testing. If the results are positive, the structure shall be re-sterilized as set out herein above until negative test results are obtained.

C. The structure shall not be placed into service until negative results are obtained.

3.08 INTERIOR PAINTING (ZINC RICH PRIMER/HIGH SOLIDS EPOXY)

A. SURFACE PREPARATION

1. The entire surface shall be blast cleaned to a Near White Metal Finish, removing all mill scale, rust, dirt, paint, or foreign matter by any of the recommended methods outlined in the Society for Protective Coatings Specification SSPC-SP10 to establish a minimum blast profile of 2.0 mils.

B. PRIMER COAT:

1. Immediately after blasting and before any rusting occurs, apply one coat of Tnemec Series 94 -H_20 Hydro-Zinc primer to all bare steel surfaces. The coating shall be applied at 2.5 to 3.5 mils DFT.

C. PITS & SEAMS

1. After the application of primer, spot fill all pits deeper than 1 /16 inch or less than 1/2 the steel thickness with TNEMEC Series 215 Surfacer until flush with existing surface. A Pay Item is included in the Bid Proposal for Pit Filling. Seal all backing strips, seams, lap joints above the high-water level where required, with Sika-Flex 1A applied after the finish coat has been applied. The cost of sealing with Sitka-Flex 1A shall be included in the Pay Item for the Interior Coating of the tank.

2. Pits and seams requiring welding to repair the tank will be ordered in writing by the engineer/owner as an addition to the price for painting the tank. Welding shall meet the requirements of AWWA - D 100 standards and be completed prior to the application of any coatings.

D. INTERMEDIATE COAT:

1. Apply one (1) coat of TNEMEC Series 20HS / FC20HS-39BL Pota-Pox Delft Blue. This coating to be applied at 4.0 to 6.0 mils DFT.

E. STRIPE COAT

1. Apply one (1) coat of TNEMEC Series 20HS / FC20HS-15BL Pota-Pox Tank White to all weld seams by brush or roller.

F. FINAL FIELD COAT

1. Apply one (1) coat of TNEMEC Series 20HS / FC20HS-15BL Pota-Pox Tank White at 4.0 - 6.0 DFT.

3.09 EXTERIOR PAINTING (ZINC/EPOXY/URETHANE)

A. SURFACE PREPARATION

1. The entire exterior surface shall be blast cleaned to a Commercial Finish, removing all existing mill scale, rust, dirt, paint, or foreign matter by any of the recommended methods outlined in the Society for Protective Coatings Specification SSPC-SP 6.

B. PRIMER COAT

1. Immediately after blasting and before any rusting occurs (within 12 hours maximum) apply one (1) coat of TNEMEC Series 91 / 94-H_20 Hydro-Zinc primer to unpainted areas. This coating to be applied at 2.5 to 3.5 mils DFT.

C. INTERMEDIATE COAT

1. Apply one (1) coat of TNEMEC Series 73-Color Endura-Shield at 2.0 - 3.0 mils DFT.

D. FINISH COLOR COAT

1. Apply one (1) coat of TNEMEC Series 740-COLOR UVX in a color selected by the Engineer/Owner at 2.5 - 5.0 mils DFT.

E. LOGO

1. Apply one (1) coat of TNEMEC Series 740-COLOR UVX in a color selected by the Engineer/Owner at 2.5 - 5.0 mils DFT. Darker colors may require two coats for hide.

PART 1 – GENERAL INFORMATION

1.01 GROUNDWATER PROTECTION AND EROSION CONTROL

A. All wet weather conveyance and stream crossings will be accomplished in conformance with the regulations promulgated by the Tennessee Department of Environment and Conservation.

B. No blasting will be permitted in any streambed.

C. The **Contractor** will perform erosion control inspections before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every 14 calendar days. Where sites have been finally or temporarily stabilized, or runoff is unlikely due to winter conditions (e.g. site covered with snow, ice, or frozen ground) such inspections only must be conducted once per month.

D. Inspections shall be documented and include the scope of the inspection, name(s) and title or qualifications of personnel making the inspection, the date(s) of the inspection, major observations, and actions taken.

E. Based on the results of the inspection, any inadequate control measures or control measures in disrepair shall be replaced or modified, or repaired as necessary, before the next rain event if possible, but in no case more than seven days after the need is identified. If maintenance prior to the next anticipated storm event is impractical, maintenance must be scheduled and accomplished as soon as practicable.

F. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has temporarily or permanently ceased. Except where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 15 days, temporary stabilization measures do not have to be initiated on that portion of site.

G. Temporary or permanent soil stabilization shall be accomplished 15 days after final grading or other earth work. Permanent stabilization with perennial vegetation (using native herbaceous and woody plants where practicable) or other permanently stable, non-eroding surface shall replace any temporary measures as soon as possible.

1.02 OBSTRUCTIONS TO BE REMOVED AND REPLACED

A. The scope of the Construction Drawings does not include an exhaustive identification of all obstacles which may be encountered during installation of the proposed facilities.

B. The **Contractor** shall follow the provisions of T.C.A. 65- 31-101 et seq.,: "Underground Utility Damage Prevention Act" to the letter in order to identify underground facilities in the vicinity of the work. All work near any unidentified obstacles or underground facilities shall cease until the ownership, location, and nature of the obstacle is determined. The **Contractor** shall fully indemnify the **City** and the **Engineer** for any damages resulting from non-compliance with T.C.A. 65-31-101 et seq. and this portion of the specifications. For all work covered under this project where existing water system facilities may occur, the **City of Tiptonville** of Lake County, TN hereby delegates it responsibilities under the "Underground Utility Damage Prevention Act" to the **Contractor**.

C. In cases where other water lines, gas lines, sanitary sewer lines, storm sewer lines, telephone lines, power lines or other underground structures are encountered, they shall not be displaced or molested unless necessary in which case they shall be replaced in as good condition as found, as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the **Contractor's** expense.

D. In cases where the pipe crosses drainage culverts the carrier pipe shall be encased in PVC pipe and the following conditions shall prevail:

1. The minimum dimension from the top of the culvert to natural grade must equal 46 inches plus the diameter of the required casing pipe.
2. At least 16 inches of natural cover will be provided between the bottom of the casing pipe and the top of the culvert.
3. The PVC casing pipe will extend no less than 18 inches beyond each side of the culvert.

E. In cases where proper cover for the pipe as described above does not exist, the pipe will be installed under the culvert with a natural cover of 18 inches between the bottom of the culvert and top of the pipe. Casing shall be provided as described above.

1.03 INSPECTION BY THE CITY

A. Before the **Contractor** backfills any of the lines, they shall first be inspected by the **City** and the **City** shall give the **Contractor** permission to proceed with the backfilling. If any joints, pipe, fittings, or other materials and workmanship are found to be defective, they shall be removed and replaced by the **Contractor** without any additional compensation.

1.03 TRAFFIC CONTROL

A. The **Contractor** shall, before beginning work on any public highway, or roadway plan for maintaining traffic on the said highway or roadway or re-routing traffic as may be required. The applicable regulations of the Tennessee Department of Transportation must be followed. Prudent use of flagmen and acceptable signs will be exercised by the **Contractor**.

B. Should it become necessary to provide additional guying or support of power, lighting or telephone facilities, the authorities of these utilities shall be consulted so that suitable arrangements can be made for protection of same.

C. All costs for temporary or permanent work necessary for protection of utilities private or public, shall be included in the contract amounts to which the items of work pertain or may be incidental thereto. In addition, the **Contractor** shall be responsible for any damage to the existing utilities resulting from the construction operations and shall bear the cost of all repair or replacement necessary for correction.

D. The **Contractor** shall furnish proper equipment which shall always be available maintaining streets and roads upon which work is being performed. All such streets and roads shall be maintained for traffic until complete and final acceptance of the work.

E. When the **Contractor** is cutting perpendicular to cross a street or highway, he is to cut half of the street at one time, lay the pipe and complete the backfilling operation so that traffic may pass over this section before opening the trench for the other half of the street or highway. At points of heavy traffic, this work shall be done at night during period of low rates of traffic. The time of making these crossings shall be approved by the **Engineer** and the agency or legal entity having responsibility for maintenance of the street.

PART 2 – MATERIALS

2.01 DUCTILE IRON PIPE

A. Pipe with mechanical joints or push-on joints shall conform to the applicable dimensions and weights shown in the Handbook for Ductile Iron Pipe standard and to the applicable requirements of ANSI/AWWAC111/A21.11 of the latest revision. The mechanical-joint glands shall be cast iron in accordance with ANSI/AWWAC111/A21.11 of latest revision and bolts shall conform to the requirements of the same standard.

B. The nominal laying length of the pipe shall be as shown in the tables appearing in the Handbook for Ductile Iron Pipe.

C. The outside coating for shall be an asphaltic coating approximately 1 mil (25um) thick. The coatings shall be applied to the outside of all pipe, unless otherwise specified. The finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun and shall be strongly adherent to the pipe.

D. Cement linings shall be in accordance with the latest revision of ANSI/AWWAC104/A21.4, Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water.

E. Each pipe shall be subjected to a hydrostatic test of not less than 500 psi (3.45 MPa). This test may be made either before or after the outside coating and inside coating have been applied but shall be made before the application of the cement lining. The pipe shall be under the full test pressure for at least 10s. Suitable controls and recording devices shall be provided so that the test pressure and duration may be adequately ascertained. Any pipe that leaks or does not withstand the test pressure shall be rejected. In addition to the hydrostatic test before application of a cement lining or special lining, the pipe may be retested, at the manufacturer's option, after application of such lining.

2.02 DUCTILE IRON FITTINGS

A. All fittings shall be mechanical joint ductile iron ASTM A536 Class 350 fittings conforming to ANSI/AWWA C153/A21.53-84 and meet UL-FM requirements. Cement lining and coating shall be in accordance with ANSI/AWWA C104/A21.4. NSF 61 Certified. SBR Gaskets in accordance with ANSI/AWWA C111 / A21.1. **All fittings including tees, bends, and reducers shall be mechanical joint "anchor" fittings. Slip joint fittings are not acceptable. All valves and fittings will be restrained with Mega-Lug type restraints.**

2.03 GRIPPER GASKETS (3 INCHES – 24 INCHES)

A. At overbends and for ductile iron joints in both bored and open cut casing pipes, the use of Gripper Gaskets is required. Additionally, install Gripper Gaskets at two joints beyond both sides of the casing. Installation of Gripper Gaskets shall also include casings at bridge crossings.

B. Joint restraint for ductile iron water systems including pipe, valves and fittings shall be accomplished using integral boltless restraining gaskets. Pressure rating 350 psi. These gaskets shall be designed, manufactured and tested in accordance with AWWA C111/A21.11. Certified to NSF/ANSI 61. UL Recognized Component. Boltless restraining gaskets shall be Gripper Gasket or equivalent.

2.04 POLYVINYL CHLORIDE (PVC) PIPE

A. Plastic Pipe shall be SDR17 PVC pipe where indicated on the drawings and SDR21 PVC pipe in all other locations.

B. Pipe must meet all the requirements as set forth in Product Standard PS 22-70 (formerly Commercial Standard CS 256-63) for PVC Type I, Grade I, PVC 1120 or PVC Type I, Grade 2, PVC 1220 only, with standard dimension ratio of SDR17, and bear the National Sanitation Foundation Testing Laboratories, Inc., seal of approval for potable water.

C. Provisions must be made for contraction and expansion at each joint with rubber ring, tapered end and bell as integral part with the pressure class being maintained throughout the entire bell section.

D. **Plastic fittings shall not be permitted for sizes larger than 2 inches.** Only ductile iron fittings as specified hereinbefore, and as manufactured for jointing with PVC pipe will be permitted. All fittings shall be mechanical joint. Slip joint fittings are not acceptable.

E. **All valves and fittings will be restrained with Mega-Lug type restraints.**

F. PVC pipe shall be in 20-foot lengths and shall be transported to and about the job site with trucks or pipe trailers which provide support for not less than 75% of their lengths. At least two (2) men shall be used to load, unload and stockpile PVC pipe, and the pipe shall be lifted and placed in position without dropping, tossing, or otherwise being abused. PVC pipe shall not be pulled or pushed over objects that can gouge, cut, or damage the pipe. Care in handling shall be exercised during cold weather conditions.

G. All installation specifications covering the use of other type of pipe shall be used with plastic pipe. However, no plastic pipe shall be used in marshy places, below the normal ground water table, or in areas of finely divided granular soils. Alternate pipe materials will be identified by the **Engineer** and/or specified on drawings.

H. Only PVC pipe manufactured with the Reiber type gasket is acceptable. Pipe shall be provided from a manufacturer having no less than a five-year history of providing pipe in Tennessee and with no less than 250,000 linear feet previously installed in Tennessee.

2.05 HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS FOR DIRECTIONALLY BORED CROSSINGS

A. All polyethylene pipe and fittings shall be material cell classification 345434C, material designation, PE 3408, DR9.

B. All pipe and fittings shall be joined by the butt heat fusion process, and the **Contractor's** personnel performing the heat fusion shall be qualified by appropriate training and experience in the procedure.

C. The **Contractor** shall take every precaution in handling the PE pipe and fittings to insure scratching, gouging, or other damage does not occur. Pipe having a nominal diameter of two inches or less shall normally be installed by unrolling from a reel trailer to prevent damage. If the pipe or fittings are scratched or gouged due to improper handling, the affected areas shall be replaced at the **Contractor's** expense.

D. All joining shall be made by qualified personnel and shall be the butt heat fusion process in accordance with the pipe manufacturer's written procedures. An approved butt fusion machine shall be used for the heat fusion process.

E. The **Engineer** shall have the right to inspect the joining process to insure it is being performed in accordance with the written procedure and shall have the right to inspect the completed fusion joint for proper appearance. If the **Engineer** determines the fusion joint was not made in accordance with proper procedure or if the joint does not exhibit the proper appearance, the joint shall be cut out and replaced at the **Contractor's** expense.

F. Pipe, tubing, and fittings shall meet the requirements of ASTM D 2513 as mandated by CFR 49 Part 192 et al and shall be so marked. Fittings shall meet the requirements of ASTM D 3261 and shall be marked as such in accordance with ASTM D 2513. Socket Fusion Fittings shall meet the requirements of ASTM D 2683 and shall be marked as such in accordance with ASTM D 2513.

2.06 GATE VALVES, BOXES, CONCRETE COLLARS, AND MARKERS

A. **Pipe 8 inches in diameter and smaller shall be fitted with gate valves. All valves will be restrained with Mega-Lug type restraints.** Valves boxes will not be paved over or covered with fill material.

B. All gate valves shall be of the resilient seat type valve manufactured to meet or exceed the requirements of ANSI/AWWA C509-Latest Revision, and suitable for water working pressures of no less than 200 psi unless otherwise specified. Valves shall be of standard manufacture and of the highest quality both as to materials and workmanship.

C. The wedge shall be fully encapsulated in the elastomer, including the guides. The brass stem nut must be rigidly enclosed in the wedge to maintain alignment. The wedge elastomer shall be bonded to the wedge. The stem shall be stainless steel (AISI-420).

D. Valve body and bonnet shall be electrostatically applied, fusion bonded, epoxy coated both inside and out by the valve manufacturer. The coating shall meet the requirements of AWWA C-550.

E. The bonnet bolts shall not be exposed to the environment or, alternatively, be in 316 stainless steel. O-ring style seals shall be used as gaskets on the bonnet and on the stuffing box.

F. All gate valves shall be furnished with mechanical joint end-connections, unless otherwise shown on the plans or specified herein. Slip joint connections are not acceptable. The end-connections furnished shall be suitable for connecting to standard mechanical joint ductile iron pipe or single gasket slip-on joint PVC pipe.

G. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

H. All gate valves shall be provided with a 2-inch square operating nut and shall open by turning to the left (counter clockwise).

I. Gate valves shall be installed in a vertical position with cast iron valve box and shall be installed on a firm bed at the proper elevations to conform to elevation of the pipe.

J. Hand wheel valves are not acceptable except when used in a building, pit, or vault.

2.07 BUTTERFLY VALVES, BOXES, CONCRETE COLLARS, AND MARKERS

A. Butterfly valves shall be manufactured by Crispin / K-FLO, Dezurik, Pratt, or approved equal. The Manufacturer shall have had a successful experience in manufacturing tight closing Buna-N or other acceptable synthetic rubber-seated butterfly valves for this type service in the size indicated. The Manufacturer shall have at least 10 years' experience in the manufacture of valves. All butterfly valves of the same type shall be the product of one Manufacturer. All materials used shall be new, of high grade, and with properties best suited to the working environment.

B. All butterfly valves shall be of the tight-closing, rubber seated type, conforming to the design standards of ANSI/AWWA C504 latest revision, except where noted herein. Valves shall be bubble-tight at the rated pressure in either direction and shall be suitable for throttling service and/or operation after long periods of inactivity. Maximum operating non-shock shut-off pressure and maximum operating non-shock line pressure is 250 psi. Each valve shall be performance and leak tested as specified in AWWA C504 revised as follows: In

addition to the testing requirements of AWWA C504, each butterfly valve shall be thoroughly cleaned and opened at least three (3) times prior to testing.

C. All valves shall have the name or symbol of the maker, the nominal size, date of manufacture, and the working pressure for which they are designed, cast, stamped or permanently marked on the body.

D. Butterfly valves shall be Class 250B, unless otherwise indicated and of the flanged short body design. The valve bodies shall be constructed of ductile iron in accordance with ASTM A-536.

E. Discs shall be constructed of 316 stainless steel or epoxy coated ductile iron ASTM A-536. All ductile iron discs shall have a 316 stainless steel disc edge. Discs for valve sizes 24 inches and larger shall be of the offset design to provide a full 360-degree seating surface and shall be constructed from epoxy coated ductile iron ASTM A-536.

F. Valves 3 inches to 20 inches shall have a one piece through shaft constructed of 17-4 stainless steel corresponding to the requirements of AWWA C504, latest revision. The shafts shall be fastened to the disc by means of a threaded disc pin providing a positive leak proof connection of the shaft to the disc. Valves 24 inches and larger shall have stub shafts of 17-4 stainless steel corresponding to the design requirements of AWWA C504, latest revision. The shafts shall be fastened to the disc by straight pins that provide a .005 interference fit.

G. The resilient seat shall be Buna-N for valves 3 inches to 20 inches and shall be simultaneously bonded and vulcanized to body of the valve. All interior surfaces in contact with water, excluding stainless steel and disc, shall be completely rubber lined. Seats for valves 3 inches to 20 inches shall be designed so that they will require no internal adjustment or maintenance to seat against a pressure differential of 250 psi on either side of the valve. The resilient seat shall be Buna-N for valves 24 inches and larger and shall be fully adjustable and replaceable in the field.

H. All bearings shall be of the self-lubricating, corrosion-resistant, sleeve type. Bearings shall be designed for horizontal and/or vertical shaft loading. The valve assembly shall be furnished with a factory set two-way thrust bearing designed to center the valve disc in the valve seat at all times.

I. Shaft packing shall be of the V-type, self-adjusting type and suitable for pressure and vacuum service or PTFE, interlocking braid, self-compensating type. Stuffing boxes for pull down packing shall have a depth sufficient to accept at least four (4) rings of self-compensating type packing specifically selected for the operating pressure to be encountered.

J. The interior of valves 3 inches to 20 inches shall be completely rubber lined. The valve disc shall either be entirely 316 stainless steel or be epoxy coated from an AWWA NSF-61 coating system. The use of liquid epoxy on body interior surfaces shall not be allowed. Valves 24 inches and larger: the interior of the valve body and the exterior of the valve disc shall be cleaned and sandblasted and lining shall be applied as per the Manufacturer's instructions. The lining material shall follow ANSI/NSF Standard 61, for contact with potable water. The lining material shall be "Pota-Pox" as manufactured by Tnemec, or equal. The interior lining shall be applied in a minimum of two coats at 4 – 5 mils per coat; the total dry thickness shall be 8 – 10 mils.

K. The exterior surfaces shall be cleaned and sandblasted and coating shall be applied in accordance with the Manufacturer's instructions. Surface cleanliness shall be inspected and any contaminants on the surface shall be removed prior to the coating operations. The coating material shall be "Pota-Pox" as manufactured by Tnemec, or equal. The coating material shall be applied in a minimum of two coats, at 4 – 5 mils per coat; the total dry thickness shall be 8 – 10 mils.

L. Valve installation shall be in strict accordance with the Manufacturer's printed recommendations, and the Contract Documents. Valve shaft shall be truly vertical or horizontal as indicated.

M. Four (4) copies of Final Operations and Maintenance Manuals are to be provided. The manuals shall include but not be limited to the following: installations and adjustment instructions; maintenance procedures and operation parameters; wiring diagrams; control diagrams; control sequence and instructions; lubrication schedule, including type, grade, temperature range, and frequency; diagrams and illustrations; test procedures, performance data; and parts list.

N. Upon completion of installation of the butterfly valves an acceptance test shall be conducted to verify the satisfactory to the **Engineer** before final acceptance will be made by the **City**.

O. The manufacturer warrants the workmanship and material to be free from defect for a period of one (1) year from the date of shipment from the factory. The manufacturer shall replace any parts deemed defective during the said time period, provided that the product has been properly applied and used for the purpose intended. The manufacturer must be notified of the alleged defect and provided with the proper data as to this application. The manufacturer at its discretion will repair or replace the product, F.O.B. factory. The manufacturer shall not be liable to the buyer or others for any consequential or incidental damage. The unit shall not be disassembled in any way by the buyer, unless written permission and instruction is provided by the manufacturer – otherwise the warranty is void. The buyer agrees that the manufacturer shall not be liable

for any loss, cost, expense, or damages from the product, its uses, installation or replacement instructions, labeling, technical data, description of the product, its uses or warnings or lack of any of the foregoing. No other warranties, written or oral, expressed or implied, shall apply.

2.08 CHECK VALVES

A. Check valves shall have a cast iron or ductile iron body. Body seats shall be bronze or stainless steel. Valve body shall be enlarged to allow disc to swing in the waterway. When valve is full open, body design shall permit a "full flow" thru the valve equal to the nominal pipe diameter. They shall comply with AWWA Standard C-508's latest revision.

B. All cast iron parts shall conform to ASTM A126 Class B, or ASTM A48 Class 40C. All ductile iron shall conform to ASTM-A-536 GR 65-45-12. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed.

C. Discs shall have a Buna-N rubber seat ring for sizes thru 3"-36" for water or sewage service.

D. Check valves shall be supplied with a side mounted lever arm and counter weight or spring to aid in the valve closure to prevent flow reversal.

E. Hinge pins shall be 304 Stainless Steel rotating in bronze bearings.

F. Bolts shall be electro-zinc plated steel with hex heads and hex nuts in accordance with ASTM A-307 and A-563 respectively.

G. Check valves shall be constructed to permit top entry for complete removal of internal components without removing the valve from the line. Gaskets shall be conventional in all sizes 3"-36". Valves shall be suitable for installation in either a horizontal or a vertical position.

H. The inside and outside of all valves shall be coated with two coats 8 mils total DFT of an NSF approved epoxy coating accordance with AWWA standards.

I. Marking shall be in accordance with AWWA C-508 and shall be in accordance with AWWA C-508 and shall include size, working pressure, and cast arrow to indicate direction of flow, and name of manufacturer.

J. Check valves shall be model SWL swing check valves as manufactured by Crispin Valves or equal.

2.09 AIR VALVES

A. Air Valves and boxes shall be installed on water lines at high points in the lines as shown on the plans or as directed.

B. The Air Valve assembly shall be made up of a standard yoke, curb stop, service tubing, locking corporation stop, and air release valve installed in a standard residential meter box. The meter box protecting the assembly stop shall not be installed in a borrow ditch or other unsuitable location.

C. Air Valves for clean water service shall be the size and the type as per the project drawings.

D. Air Valves for clean water service shall be in full compliance with these specifications and AWWA standard C512-92 or latest revision.

E. Valve bodies shall be constructed of Cast Iron ASTM A126 Class B, Cast Iron ASTM A48 Class 40C, or Ductile Iron, ASTM A536 grade 65-45-12. The float shall be constructed of series 300 stainless steel, ASTM A240. The internal linkage or trim shall be made of Stainless Steel or corrosion resistant materials. Valves with plastic/nylon bodies, plastic/composite floats, and/or plastic linkage shall not be acceptable.

F. Unless otherwise shown or noted on the project drawings, valves shall be rated for a working pressure from 20 to 150 psig. Valves operating from 5 to 20 psig shall be designated as low pressure valves, and valves operating from 150 to 300 psig shall be designated as high pressure valves. Regardless of the working pressure all threaded inlet valve bodies shall be rated to withstand 300 psig. The **Contractor** shall verify the system pressures at the air valve location before air valves are ordered.

G. All threaded inlets and outlets shall be NPT standard for cast iron pipe threads. All flanged ends shall meet ANSI B16.1 Class 125/150# standards unless shown on the project drawings as Class 250/300#.

H. The valve exterior shall be coated with a rust inhibitive primer. The interior on valves 3 inches and larger shall have a minimum of two coats or 8 mils total thickness of Tnemec Pota-pox two-part epoxy paint or equal. All valves on dual body valves 3 inches or larger shall have the interior coating. The epoxy paint shall be white, beige, green or blue. As an option the interior and exterior of valves 3” and larger may be coated with a fusion bonded epoxy.

I. Exterior bolting on air valves 2 inches and smaller shall be carbon steel. The exterior bolting on air valves 3 inches and larger shall be type 18-8 or type 304 stainless steel.

J. Air valves shall be manufactured by one of the following manufacturers: Crispin / Multiplex, Apco / DeZurik, Cla-Val, Flo-Matic, GA Industries / Empire, Henry Pratt Company, Val-Matic, or approved equal.

K. Air Valves for clean water service shall be one of the following types:

1. AIR/VACUUM VALVE: This valve automatically exhausts large quantities of air during filling of the pipeline. It also allows air to re-enter the pipeline during drainage or when negative pressure occurs. This valve shall close and be drip tight while the pipeline is pressurized.

   Air/Vacuum Valves for clean water service shall have the same size inlet and outlet. Unless shown otherwise on the project drawings, valves 2 inches and smaller shall have N.P.T. inlets and outlets, and valves 3 inches and larger shall flanged inlets. Unless shown otherwise on the project drawings, valves 3 inches and larger shall have a hooded outlet to keep debris out of the valve.

   Air/Vacuum Valves 3 inches and larger shall be equipped with a flanged Surge Check Valve. The Surge Check Valve shall be installed on the inlet of the Air/Vacuum Valve. The Surge Check valve shall have a Cast Iron ASTM A126 Class B, Cast Iron ASTM A48 Class 40C, or Ductile Iron, ASTM A536 grade 65-45-12 valve body. The valve Disc shall be type 316 Stainless Steel ASTM A351 Type CF8M with a type 316 stainless steel spring.

   Air/Vacuum Valves 3 inches to 12 inches shall have a 1" tapped and plugged hole in the side of the body for the future addition of an Air Release Valve. Air/Vacuum Valves 14 inches and larger shall have a 2 inch tapped and plugged hole.

2. AIR RELEASE VALVES: This valve automatically exhausts small amounts of air that accumulate at the valve while the pipeline is pressurized.

   Air Release Valves for water service shall have N.P.T. outlets. Unless shown otherwise on the project drawings, valves 2 inches and smaller shall have N.P.T. inlets, and valves 3 inches and larger shall have flanged inlets.

   Air Release Valves 1 inch and larger shall be of the compound lever type.

3. COMBINATION VALVES: This valve shall have the same functions of an air/vacuum valve and air release valve combined.

   Combination Valves 2 inches and smaller shall be the single body type with the air/vacuum and air release functions in one housing. Combination valves 3 inches and larger shall be dual body type with an air release valve piped into the side of the air/vacuum valve. A gate valve shall be installed between the air/vacuum and air release valve to isolate the air release valve. Valves 3

inches and larger shall be equipped with a flanged Surge Check Valve. The Surge Check Valve shall be installed on the inlet of the Air/Vacuum Valve. The Surge Check valve shall have a Cast Iron ASTM A126 Class B, Cast Iron ASTM A48 Class 40C, or Ductile Iron, ASTM A536 grade 65-45-12 valve body. The valve Disc shall be type 316 Stainless Steel ASTM A351 Type CF8M with a type 316 stainless steel spring

Unless shown otherwise on the project drawings, valves 2 inches and smaller shall have N.P.T. inlets and outlets, and valves 3 inches and larger shall have flanged inlets. Unless shown otherwise on the project drawings, valves 3 inches and larger shall have a hooded outlet to keep debris out of the valve.

4. DEEP WELL AIR/VACUUM VALVE: This valve is installed between the pump discharge and a check valve. The Deep Well valve shall have an adjustable throttling outlet device. This valve automatically exhausts large quantities of air during pump start-up. It also allows air to re-enter the pump column during pump shutdown. This valve shall close and be drip tight while the pipeline is pressurized.

   The Throttling Top shall be adjusted in the field to allow all the air to escape before the check valve opens. Also it shall be adjusted to keep the float ball from slamming into the resilient seat.

   Deep Well Valves shall have the same size inlet and outlet. Unless shown otherwise on the project drawings, valves 2 inches and smaller shall have N.P.T. inlets and outlets, and valves 3 inches and larger shall flanged inlets.

2.10 VALVE BOXES, CONCRETE COLLARS, AND MARKERS

A. Valve boxes shall be cast iron, two-piece, screw type with drop cover marked “Water”. Concrete traffic boxes are required where they are located within the street or parking area. They shall be set vertically and properly adjusted so that the cover will be in the same plane as the finished surface of the ground or street.

B. Valve boxes shall be as manufactured by Mueller, Chapman, M & H, or approved equal.

C. A concrete collar as shown on the plans is to be poured around each valve box to prevent it from being disturbed or moved from its proper alignment. The minimum thickness of the concrete collars shall be 4 inches. Precast square collars are acceptable. The collar shall have a firm base and not be poured on fill or disturbed dirt.

D. For installations in rural areas, a valve marker as shown on the plans is to be installed in the vicinity of the valve box to insure easy location of the valve. Valve

markers shall be as manufactured by Carsonite International. Provide blue color-coded marker with APWA/ULCC approved decal for use with potable water systems. The marker shall be located so as to prevent it from being moved or damaged by road maintenance equipment. It shall also have the distance to the valve painted on the back of the marker.

2.11 TAPPING SLEEVES

A. Tapping sleeves shall be of the Mechanical Joint (MJ) type. Tapping sleeves on 8 inches and below PVC water lines shall be either epoxy coated or stainless steel.

2.12 CONCRETE THRUST BLOCKS, ANCHORS, CRADLES, AND / OR ENCASEMENT

A. Poured in place concrete thrust blocks and Mechanical Joint Restraints shall be provided at all bends, tees and valves, dead-ends, tapping tees and all other points of unbalanced pressure where the pipe line could pull apart. Thrust blocks shall be as shown on the detail sheet and shall bear against the undisturbed trench face. Concrete shall be Class B concrete poured only in temperatures well above freezing. Cover fittings with plastic sheeting to prevent concrete from covering all nuts and bolts on fitting assemblies.

B. Concrete for anchors, cradles, or encasement shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. No “sack crete” may be used for any anchors, cradles and/or encasement.

2.13 FIRE HYDRANTS

A. All fire hydrants shall conform to the requirements for the current standard specifications of the American Water Works Association for fire hydrants or ordinary water works practice (C502-54) except as such specifications are modified or amended herein and shall be as manufactured by M & H Valve and Fittings Co., Mueller, or American Darling.

B. Three-way fire hydrants shall be furnished with two hose connections each two and one-half inches in diameter and one, four and one-half inch diameter pumper connection unless otherwise called for on the plans. Provide pent operating nut.

C. The height of each hydrant shall result in the correct vertical distance from the bottom hydrant to the finished ground line. Fire hydrants shall be raised or lowered to finished grade as necessary to meet this requirement.

D. Hydrants shall be designed for mechanical joint connections unless otherwise shown on the plans. Unless otherwise directed by the **Engineer**, the nozzles and caps shall be cased to National standard hose and streamer nozzle threads (see B-26-1925, with latest revision).

E. Hydrants shall be designed to open by turning the opening nut to the left, or counter-clockwise. An arrow and the word "OPEN" shall be cast in relief on the top of the hydrant to designate the direction of opening.

F. Fire Hydrants shall be painted or coated in the manner designated in the AWWA Specifications and named above (C503), the color or paint above the finished ground line to be as selected by the **Engineer**. After installation, the hydrants shall be repainted above ground if, in the opinion of the **Engineer**, the shop coating has been damaged or its appearance marred by handling.

G. Fire hydrants shall be installed in a vertical position at the location shown on the plans or directed by the **Engineer**.

2.14 BLOW-OFF ASSEMBLIES

A. Blow-offs shall be installed at the location as shown on the plans, or as directed by the **Engineer**. The **City** prefers the use of the below ground blow-off assembly detailed on the Typical Details sheet of the Drawings. Use fire hydrants in residential subdivisions where practical.

2.15 SERVICE ASSEMBLIES

A. Water Meters

1. All new water meters shall meet the requirements of the latest "American Water Works Association Standard Specifications for Cold-Water Meters – Displacement Type."

2. Meters shall be housed in an all cast bronze case with hinged cover and shall be of the "Frost-proof" type. The meter register shall read in gallons and shall be hermetically sealed to prevent condensation and keep out water and foreign materials. The meters may be either of the piston operated type or of the disc operated type. The meter shall be equipped with a stainless-steel strainer and shall be of the magnetic drive type. The minimum meter size required is five-eighths inches (5/8") by three-quarter inches (3/4") where no fire suppression sprinkler system is to be installed or one inch (1") where fire suppression sprinkler systems shall be installed. Meters and shall have maximum capacities as shown in the following table:

Meter Size	Maximum Capacity
5/8 inch x 3/4 inch	20 gpm
1-1/2 inch	100 gpm
2 inch	160 gpm

3. The meters shall be the magnetic-drive remote read meter as manufactured by the Badger Meter, Inc., with lead free bronze body, or an approved equal, with remote read transmitting head.

4. Commercial meters larger than 2 inches in diameter shall be remote read meter as manufactured by Badger Meter, Inc. compound meters, and shall be supplied by the contractor. The customer shall be responsible for installing and maintaining a reduced pressure backflow preventer on all commercial services.

5. The customer shall be responsible installing and maintaining a double check valve on all fire lines.

B. Meter Boxes

1. All meter boxes shall be plastic meter boxes as manufactured by Goddard Concrete Products, Inc. Model 36H15 with 36HCL or equal for ¾" meters and Goddard Concrete Products, Inc. Model 65H15 with 65HCL or equal for 2" meters. Lids shall have AMR reader opening.

C. 3/4" Service Connection Piping

1. Service connection piping shall be three-fourths inch (3/4") tubing of the length necessary to run a direct line from the main to the meter at the property line. Tubing shall be HDPE NSF-14 pipe and AWWA C901, PE 200 pipe. Special care shall be taken to protect the service piping with earthen material, from sharp and hard objects. Cover is to be at least twenty-four inches (24") at all points.

D. Water Service Connections

NOTE all products must be certified "Lead Free".

Water service connections shall be made in the following manner:

1. Pipe Saddles
   a. 12" x 2" – Ford S71-1207
   b. 12" x 1" – Ford S70-1204
   c. 12" x ¾" – Ford S70-1203
   d. 8" x ¾" – Ford S70-805
   e. 6" x ¾" – Ford S70-603
   f. 4" x ¾" – Ford S70-403
   g. 2" x ¾" – Ford S70-203
2. Rubber Washers
   a. 5/8" x ¾" – PS4011

   b. 1" x 1/8" – PS4012
3. Corporation Stops
   a. 2" – Ford FB500-7
   b. 1" – Ford F10004-G
   c. ¾" – Ford F10003-G
4. Curb Stops
   a. 2" – Ford BF43-777W Flanged Ball Valve
   b. 1" – Ford B43-344W Comp x Stud
   c. ¾" – Ford B41-232WG GJCTS x UC (Comp x Stud)
5. Dual Check Valves
   a. 2" – Ford HS11-777
   b. 1" – Ford HHS31-344
   c. ¾" – Ford HHS38-323
6. Customer Connections
   a. Copper – Male Adapter with SS Gear Clamp
   b. Sch. 40 – Male to CTS Adapter
7. Inserts
   a. 2" – #55 Steel / Aluminum
   b. 1" – PL-C Plastic Insert
   c. ¾" – PL-B Plastic Insert

2.15 DETECTION WIRE AND DETECTION TAPE

A. Prior to backfilling, the **Contractor** shall install 12 Gauge copper-clad wire with all PVC and PEXa pipe including service tubing for locating the pipe. The detection wire shall be continuous and shall be connected to all valve boxes, fire hydrants, and flush hydrants. The **Contractor** shall include the cost of the Detection Wire in the unit price per linear foot for the various pipe sizes. Wire shall be taped to the top of the pipe and shall loop up into valve boxes.

B. After the pipe has been installed and backfilling has been completed to a depth of 12 inches above the pipe, the **Contractor** shall install 2-inch-wide Linegard Tape or an approved equal material for locating the pipe after backfilling has been brought to the original ground level. The **Contractor** shall include the cost of the Detection Tape in the unit price per linear foot for the various pipe sizes.

PART 3 – EXCAVATION AND BACKFILL

3.01 GENERAL

A. Ductile Iron Pipe shall be laid in accordance with manufacturer's recommendations and AWWA C600. PVC Pipe shall be laid in accordance with the manufacturer's recommendations, Uni-Bell Handbook of PVC Pipe and Uni-Bell Publication 9 "Installation Guide for PVC Pressure Pipe," and AWWA C900.

B. For new construction, all streets and roads must be to grade prior to water main installation.

C. Water lines shall be laid on trench bottoms first backfilled with 6 inches of crushed stone bedding to provide continuous support for the entire length of the line. All valve and hydrant stems are to be installed plumb.

D. The pipe and fittings shall be inspected for defects immediately before being lowered into the ditch. When pipe laying operations are suspended, a watertight plug shall be inserted in the open ends of the pipe. All cuts shall be in accordance with the manufacturer's specification.

E. Pipe shall be laid with the bell ends facing in the direction of laying and shall be jointed in accordance with the manufacturer's recommendations.

3.02 TRENCH EXCAVATION

A. The minimum trench width shall be the pipe diameter plus 18 inches.

B. The depth of the trench shall provide a minimum of 30 inches of cover over the top of the pipe except where the pipe is located in a borrow ditch, or under a highway or roadway, no less than 48 inches of cover shall be provided.

C. Otherwise, the depth of the trench shall provide a maximum of 48 inches of cover over the top of the pipe.

D. Where rock is encountered the trench shall be excavated to a depth of 6 inches below the bottom of the pipe to provide space for 6 inches of crushed stone bedding.

E. Installation of pipe in a borrow ditch will be accepted only where alternate locations are unavailable. The following will prevail in this situation:

6. The cover depth of the pipe will be increased to no less than 42 inches.
7. Gate valves and blow-offs will not be in a borrow ditch.

F. All depths of cover are measured to the top of the pipe to the nearest finished grade at pipe location.

G. Lateral Cover: Where the pipe trench runs adjacent and parallel to a ditch a minimum lateral dimension cover of 30 inches will also be maintained as measured from the side of the pipe to the ditch wall.

3.03 ROCK EXCAVATION AND BLASTING

A. All blasting shall be conducted in accordance with the municipal ordinances and state laws. All damage done by blasting is the responsibility of the **Contractor** and shall be promptly and satisfactorily repaired by same.

3.04 REMOVAL OF WATER

A. The **Contractor** shall provide adequate facilities for promptly removing water from all pipe line trenches and excavations. No mains shall be installed in trenches with standing water.

B. This item shall include the excavation of all solid rock, such as limestone or sandstone occurring in mass or ledge formation of such character as to warrant removal by drilling and / or blasting. It shall also include the removal of boulders equal to or greater than one-half cubic yard in size. When blasting is necessary, extreme care shall be exercised so as not to scatter loose rock over the right-of-way and cultivated fields, or cause damage to property or persons. Prudent use of flagmen and proper signs will be required of the contractor when using explosives.

C. If loose rock is scattered, the Contractor shall pick up such rock and dispose of same to the satisfaction of the Engineer and the Owner.

3.05 DISPOSAL OF EXCAVATED MATERIAL

A. All excavated material not needed for backfilling purposes shall be disposed of in a satisfactory and responsible manner.

3.06 CRUSHED STONE FOR PIPE BEDDING

A. When excavating in good earth free from rock where the spoil is suitable for use as pipe bedding material, the excavated material may be used for pipe bedding and backfill.

B. Otherwise the pipe shall be bedded with crushed stone, good dirt, sand, and fine gravel.

C. Crushed stone shall be size 1/4 inch to 3/4 inch as set out in the Standard Specifications of the Tennessee Department of Transportation. The **Contractor's** unit price bid for pipe installation shall include a 6-inch bed of crushed stone and cover to a depth of 12 inches above the top of the pipe with the same material.

3.07 BACKFILLING PIPELINE TRENCHES

A. Backfilling shall always be conducted in a manner to prevent damage to the pipe and the exterior protection of the pipe. Placing of backfill about exterior

protected pipe shall be done in the presence of the **City** after the **City's** final inspection and acceptance of the pipe in place.

B. For backfilling of a trench in dirt where rock excavation is not required, crushed stone bedding will be placed in the trench for a depth no less than 6" below the pipe and 12" above the pipe.

C. In filling the remainder of the trench, the backfill material may be shoved into the trench with the blade of a grader or high lift. Compaction will generally be accomplished by "weathering in." Where tamping is required, the backfilling shall all be done in layers not exceeding six (6) inches and firmly tamped into place by tampers or rammers.

D. Before final acceptance, the **Contractor** will be required to level off all trenches where backfill material has been piled up, or to bring the trench up to the level of the surrounding street, roadway, or terrain. The **Contractor** will be required to remove from the streets, roadways, and private property all excess earth or other materials and obtain release from the agency responsible for the road or street or from property owners when on private easements.

E. Where mains cross lawns, the topsoil shall be replaced, and the lawn seeded and covered with straw. Where sod is present prior to construction the lawn shall be repaired with new sod as necessary.

F. Seeding and strawing will be required across the entire disturbed length of the project except for paved and graveled areas.

3.08 UNAUTHORIZED EXCAVATION

A. Whenever the excavation is carried beyond or below the lines and grades shown, the Contractor at his own expense shall refill such excavated space with such material and in such a manner as will incur stability of the structure involved.

PART 4 – PAVEMENT REPAIR AND SIDEWALK REPLACEMENT

4.01 GENERAL

A. The **Contractor** shall replace all street, alleys, driveways, and roadways, which may be removed, disturbed, or damaged in connection with his operation under this contract. He shall reconstruct same to the satisfaction of the Tennessee Department of Transportation, Lake County Highway Department, or other legal entity having jurisdiction. Crushed stone or creek gravel shall be used as backfill material at these locations.

B. The **Contractor** will be paid for street replacement only where the line is constructed within the paved surface. Care shall be exercised to minimize damage to graveled shoulders and paved surfaces.

C. Gravel, crushed limestone, bituminous materials, or other materials, used in the resurfacing of streets, shall meet the current requirements of the Tennessee Department or Transportation Specifications.

D. The **Contractor** shall be held responsible for all damage occurring to street paving, driveways, yards, mailbox areas, etc., due to his operation outside of the actual limits of his work and shall replace any such damage to as good or better condition than that which existed prior to the **Contractor's** operations, at no additional cost to the **City**.

E. The above responsibilities will also apply to areas located between the street/road rights-of-way and private property.

4.02 TRAFFIC BOUND BASE COURSE

A. On all trenches, where replacing streets is required, it shall be handled in the following manner:

1. The **Contractor** shall use crushed stone as a traffic- bound base course, at the proper elevation to allow for settlement, but not in such a way as to prevent traffic from using it. Crushed stone shall be Tennessee Department of Transportation Size Number 33C.
2. The **Contractor** may be required by the **Engineer** to maintain the traffic bound base course by adding crushed stone as specified hereinbefore in a safe and passable condition for a period of sixty (60) days, or until such time as in the opinion of the **Engineer** sufficient settlement has taken place; and trenches are ready for final resurfacing. Crushed stone will be paid for at the unit bid price specified in the contract.

4.03 SUBGRADE FOR FINAL RESURFACING

A. The traffic bound course hereinbefore described shall comprise the base course for all types of resurfacing.

B. When, in the opinion of the **Engineer**, the trench has reached a condition of settlement satisfactory for final resurfacing, the **Contractor** shall first strip the base course, or backfill with crushed stone, size as hereinbefore specified, to obtain the proper subgrade elevation. The subgrade shall then be rolled with an approved type roller or tamped until thoroughly compact. Any depressions shall be filled with crushed stone, as specified hereinbefore, and the process of rolling or tamping continued until the subgrade has a smooth and uniform surface.

4.04 PORTLAND CEMENT CONCRETE PAVEMENT

A. Where Portland Cement concrete pavement is to be replaced, or is required under bituminous replacement, it shall conform to the existing pavement and/or the **Engineer's** instructions (not less than 6-inch thickness) and be accomplished with Class "A" concrete.

4.05 ASPHALTIC CONCRETE PAVEMENT

A. Where asphaltic concrete pavement is to be replaced, the sub-grade shall be prepared as hereinbefore specified, and this subgrade shall comprise the base course upon which the concrete subslab and/or the bituminous pavement shall be laid.

B. Where no Portland Cement concrete sub-slab is required, the subgrade or base shall be thoroughly cleaned and broomed, and a prime coat of medium tar shall be uniformly applied by a pressure distributor or other approved pressure spray method.

C. When the prime coat has become tacky but not dry and hard, a bituminous surfacing consisting of asphaltic concrete shall be placed, spread, finished and compacted in accordance with the current standard specifications of the Tennessee Department of Highways Section 104. Compacted thickness of asphaltic concrete pavement replacement shall be 1-1/2 inches.

4.06 BITUMINOUS SURFACING (SURFACE TREATMENT)

A. Where bituminous surfacing is to be as shown on the plans, or as directed by the **Engineer**, the traffic bound base shall comprise the subgrade upon which the bituminous surfacing shall be constructed.

B. After the sub-grade or base has been prepared, thoroughly cleaned and broomed, a prime coat of medium tar shall be applied at the rate of .30 to .35 gallons per square yard.

C. When the prime coat has become tacky but not hard, bituminous material (asphalt of the grade directed by the **Engineer**) shall be applied in two (2) applications at the rate of 0.35 to 0.45 gallons per square yard for each application. The **Contractor** shall apply approximately 50 pounds per square yard of crushed stone chips between the two (2) applications of bituminous material and 35-40 pounds of chips after the final application of bituminous material.

D. Materials and workmanship shall conform to the current standard specifications of the Tennessee Department of Transportation, County, or City having jurisdiction.

4.07 UNTREATED SURFACE

A. Where the existing surface is untreated gravel or stone, the **Contractor** shall reuse native materials possible using crushed stone as required, replace the surfacing that is disturbed or removed with crushed stone as hereinbefore specified.

B. The traffic bound course hereinbefore specified shall comprise this type of surfacing; except prior to the final acceptance, the **Contractor** shall fill all depressions with crushed stone as hereinbefore specified, and thoroughly roll and grade to the existing surface.

4.08 BORED HIGHWAY, RAILROAD, AND STREAM CROSSINGS

A. Where required, the **Contractor** shall bore highway, railroad, and stream crossings. A smooth wall steel carrier pipe having a minimum wall thickness of 0.25 inches shall be installed. Where open cut crossings are shown, the **Contractor** may bore with the prior approval of the **Engineer**.

B. The **City** and / or **Engineer** shall not be responsible for any accident resulting from the boring or open-cut operation or traffic accident caused by the work being performed in or under the right-of-way. The **Contractor** shall be solely responsible for the safety of the workmen and passers-by during the course of the work and until such time the completed work has been accepted by the

governing utilities. The **Contractor** shall include in his bid the cost of necessary flagmen and watchmen to insure safe completion of the crossings.

PART 5 – DIRECTIONAL BORING

5.01 GENERAL

A. All directional drilling operations shall be done by a qualified directional drilling **Contractor** with at least (3) years' experience involving work of a similar nature to the work required of this project.

B. Notify the **Engineer** and the **District** a minimum of three (3) days in advance of the start of work.

C. All work shall be performed in the presence of the **District** or the **Engineer**.

D. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk-over system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, and trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

5.02 DRILLING RIG

A. The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.

5.03 DRILL HEAD

A. The drill head shall be steerable by changing its rotation, and shall provide necessary cutting surfaces and drilling fluid jets.

5.04 MUD MOTORS (IF REQUIRED)

A. Mud motors shall be of adequate power to turn the required drilling tools.

5.05 DRILL PIPE

A. Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

5.06 MGS PROBE

A. An electronic walkover tracking system or a Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction).

B. The guidance system shall be accurate and calibrated to manufacturer's specifications of the vertical depth of the borehole at sensing position at depths up to fifty feet and accurate to 2-feet horizontally.

C. The **Contractor** shall supply all components and materials to install, operate, and maintain the guidance system.

D. The guidance system shall be of a proven type, and shall be set up and operated by personnel trained and experienced with the system. The operator shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

5.07 MIXING SYSTEM

A. A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water, and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be minimum of 1,000 gallons. Mixing system shall continually agitate the drilling fluid during drilling operations.

5.08 DRILLING FLUIDS

A. Drilling fluid shall be composed of clean water and bentonite clay. Water shall be from an authorized source with a pH of 8.5 - 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium

carbonate or equal. No additional material may be used in drilling fluid without prior approval from the **Engineer**. The bentonite mixture used shall have the minimum viscosities as measured by a March funnel:

Rocky Clay	60 seconds
Hard Clay	40 seconds
Soft Clay	45 seconds
Sandy Clay	90 seconds
Stable Sand	80 seconds
Loose Sand	110 seconds
Wet Sand	110 seconds

B. These viscosities may be varied to best fit the soil conditions encountered, or as determined by the operator.

5.09 DELIVERY SYSTEM

A. The mud pumping system shall have a minimum capacity of 35-500 GPM and the capability of delivering the drilling fluid at a constant minimum pressure of 1200 psi. The delivery system shall have filters in-line to prevent solids from being pumped into drill pipe. Used drilling fluid and drilling fluid spilled during operations shall be contained and conveyed to the drilling fluid recycling system or shall be removed by vacuum trucks or other methods acceptable to the **Engineer**. A berm, minimum of 12-inches high, shall be maintained around drill rigs drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from containment areas to storage and recycling facilities for disposal.

5.10 PIPE ROLLERS

A. Pipe rollers shall be used for pipe assembly during final product pull back.

5.11 RESTRICTIONS

A. Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the **Engineer** prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system shall maintain line and grade within the tolerances prescribed by the particular conditions of the project.

5.12 PERSONNEL

A. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have at least two years directional drilling experience.

B. A competent and experienced supervisor representing the **Contractor** and Drilling Subcontractor shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the job site during the actual Directional Bore operation. The **Contractor** and Subcontractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner.

C. Personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with a suitable person.

5.13 CONSTRUCTION SEQUENCING

A. The **Contractor** shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the bore hole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits. Copies of all permits will be supplied to the **Contractor** by the **District**.

B. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If **Contractor** is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.

C. The **Contractor** shall place slit fence between all drilling operations and any drainage, well-fields, wetland, waterway or other area designated for such protection necessary by documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. **Contractor** shall adhere to all applicable environmental regulations. Fuel may not be stored in bulk containers within 200 feet of any water body or wetland.

D. Upon approval of the pilot hole location, the hole opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pullback operation of the required size of PVC pipe. The type

of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. The reamer type shall be at the **Contractor's** discretion with the final hole opening being a maximum of 1.5 times larger than the outside diameter of the pipe to be installed in the bore hole.

E. The open bore hole may be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous / flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pullback shall be calculated based on soil conditions, largest diameter of the pipe couplings, capacity of the bentonite mud pump, and the speed of pullback as recommended by the bentonite drilling fluid manufacture. The bentonite slurry is to be contained at the exit or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation or shall be hauled by the **Contractor** to an approved dumpsite for proper disposal.

F. The pipe shall be joined together according to manufacturer's specifications. The gaskets and the ends of pipe must be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand. The ends of pipe must be free of any chips, scratches, or scrapes before pipe is assembled. A pulling eye will be attached to the pipe pulling head on the lead stick of pipe which in turn will be attached to a swivel on the end of the drill pipe. Tracer wire (#8) solid coated copper wire shall be attached to the pulling eye and the crown of PVC pipe with a minimum of two full wraps of duct tape around the pipe. This will allow for a straight, smooth pull of the product pipe as it enters and passes through the borehole toward the drill rig and original entrance hole of the directional bore. The product pipe will be elevated to the approximate angle of entry and supported by means of a sideboom with roller arm, or similar equipment, to allow for the "free stress" situation as the pipe is pulled into the exit hole toward the drill rig. The product pullback phase of the directional operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore.

G. Following drilling operations, **Contractor** will de-mobilize equipment and restore the work site to the original conditions or better. All excavations will be backfilled and compacted according to the specifications.

H. Surface restoration shall be completed in accordance with the requirements of the contract, to a condition as good as or better than existed prior construction.

I. The **Contractor** shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the **Engineer** at completion of project.

J. The **Contractor** shall furnish "as-built" plan and profile drawing based on the log data showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation.

PART 6 – TESTING AND DISINFECTION

6.01 TESTING OF LINES

A. After pipe has been laid and backfilled (as specified hereinbefore) all pipe or any valved section thereof shall be subjected to a hydrostatic pressure of the rated pressure of the pipe. The duration of each pressure/leakage test shall be at least three hours. Under no circumstance will any pipe be subjected to pressures more than the rated pressure of the pipe. The **City** will not accept or approve payment for any pipe which has been subjected to pressures more than the pipe's rated pressure.

B. The **Contractor** shall furnish the necessary pump, recorder, gauges, meter, connections, and other equipment to properly test each section of line. A pressure recorder and charts shall be installed at every test section to record the pressure during the tests. The **Contractor** will provide pressure recorder – the **Engineer** will not provide pressure recorder. A meter shall be installed on the testing pump which measures the amount of water required to re-pressurize the main to its rated pressure after three hours.

C. No section of water line will be accepted by the **Engineer** for final payment until a satisfactory pressure/leakage test has been recorded. The charts become the property of the **City**.

D. Leakage shall be determined by the metered water pumped into the installed section of water main to return the line pressure to the specified test pressure. Leakage testing shall be conducted after service taps are completed.

E. Maximum allowable leakage per 1,000 feet of pipe shall be:

3 Hour Test

Pipe Diameter	@ 200 psi
2"	0.10 gallon
4"	0.20 gallon
6"	0.30 gallon
8"	0.40 gallon
10"	0.50 gallon
12"	0.60 gallon
16"	1.06 gallon
18"	1.35 gallon
20"	1.67 gallon

F. The normal length of pipe to be subjected to an individual pressure test is approximately 6,000 L.F. Pressure tests extending along more or less pipe length can be granted at discretion of the **City**.

G. Approved gauges filled with oil will be the only type gauge allowed for pressure testing.

H. The test shall be performed for three hours at approximately 200 psi. Where elevations vary significantly along the length of pipe under test, the **City** may direct that the test pressure at the test pump location be reduced to insure a 200-psi maximum pressure at the lowest pipe elevation under test.

6.02 WATER FOR TESTING WATER LINES

A. The cost for furnishing the water used for testing shall be paid for by the **Contractor** at the rate of $2.50 per 1,000 gallons. Water for testing pipe lines shall be purchased from the **City**. The **Contractor** shall have the prior approval of the **City** three (3) days prior to the filling of any lines. After the lines have been tested to the satisfaction of the **City**, and the lines placed in service, the **City** shall assume responsibility for all water cost.

6.03 DISINFECTION OF LINES

A. The new water lines shall not be placed in service, either temporarily or permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the **City**.

B. Disinfection as described in current AWWA Standard C651 will be accepted. A bacteriological sample will be gathered and tested every 2,500 linear feet.

C. When cutting into or repairing existing mains, disinfection:

1. Shall be performed when mains are wholly or partially dewatered.
2. Shall follow current AWWA C651 procedures including trench treatment, swabbing with hypochlorite solution, flushing, and/or slug chlorination as appropriate.
3. Bacteriological testing should be done after repairs are complete, but the water main may be returned to service prior to completion of testing to minimize the time customers are out of water.
4. Leaks or breaks that are repaired with clamping devices while mains remain full of water under pressure require no disinfection.

STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

Prepared by

Issued and Published Jointly by

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance shall be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____
COUNTY OF _____

The undersigned, principal officer of _____, an employer of five (5) or more employees contracting with _____ government to provide construction services, hereby states under oath as follows:

1. The undersigned is a principal officer of _____ (hereinafter referred to as the "Company"), and is duly authorized to execute this Affidavit on behalf of the Company.
2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the *Tennessee Code Annotated*.
3. The Company is in compliance with T.C.A. § 50-9-113.

Further affiant saith not.

_____
Principal Officer

STATE OF _____
COUNTY OF _____

Before me personally appeared _____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this _____ day of _____, 20__.

_____
Notary Public

My commission expires: _____

IRAN DIVESTMENT ACT

In compliance with the Iran Divestment Act (State of Tennessee 2016, Public Chapter No. 817), which became effective on July 1, 2016, certification is required of all bidders on contracts over $1,000.

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party hereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to T.C.A. § 12-12-106.

I affirm, under the penalties of perjury, this statement to be true and correct.

_____ _____

Date Signature of Bidder

_____ _____

Company

A bid shall not be considered for award nor shall award be made where the foregoing certification has been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefor. The **City/County of _____** may award a bid to a bidder who cannot make the certification, on case-by-case basis, if:

1. The investment activities in Iran were made before July 1, 2016, the investment activities in Iran have not been expanded or reviewed on or after July 1, 2016, and the person has adopted, publicized, and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or
2. The **City/County of _____**makes a determination that the goods or services are necessary for the **City/County of _____**to perform its functions and that, absent such an exemption, the political subdivision will be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

BID FOR UNIT PRICE CONTRACTS
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

Proposal of:

_____

(hereinafter called "Bidder"), a corporation organized in the State of

_____ / partnership / individual doing

business as:

_____.

To the City of Tiptonville of Lake County, Tennessee, hereinafter called "Owner":

The Bidder, in compliance with your invitation for bids for the Contract 122 – DRA Water System Improvements to Serve Sinova Global as listed on the Bid Proposal, having examined the plans, specifications, related documents, and site for the proposed work, and being familiar with all the conditions surrounding the construction of the proposed project including the availability of material and labor, hereby proposed to furnish all labor, materials, and supplies and construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Proposal is a part.

Bidder agrees to commence work under this contract on or before a date to be specified in the written "Notice the Contractor shall commence work under this contract within 21 days of "Notice to Proceed" issued for each bid schedule and shall fully complete the work described on each bid schedule within the consecutive calendar days shown below.

BID FOR UNIT PRICE CONTRACTS
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

Contract 122: 270 Consecutive Calendar Days

Bidder further agrees to pay as liquidated damages the sum of $200.00 for each consecutive calendar day thereafter for breach of contract.

Bidder acknowledges the following Addenda: _____.

Bidder understands that the Owner reserves the right to reject any or all the bids and to waive any formalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written "Notice of Award", the bidder will execute the formal contract attached within 10 days and deliver Surety Bonds and insurance certificates as required in the General Scope and Special Provisions.

The bid security attached in the sum of 5% of the total lump sum bid(s) is to become the property of the Owner in the event the contract and bonds are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

BIDDER'S PROPOSAL

Contract 122 - DRA Water System Improvements to Serve Sinova Global

City of Tiptonville (Owner), Lake County, Tennessee

Bid Schedule 1: Elevated Storage Tank Construction and Related Site Work

Item	Approx. Quantity		Description	Unit Price	Total Price
1	1	L.S.	Elevated Storage Tank, as Detailed in the Specifications and Shown on the Drawings, Including - Site Work and Fine Grading - Tank Foundation w/ Design Documents - Elevated Storage Tank and Coating as Specified - Inlet, Overflow, Drain Piping, and Associated Structures - Tank Sterilization - Erosion Control - Site Cleanup		
2	400	L.F.	6' High Chain Link Fence w/ Double Gate, Green Class 2B Coating		
3	1,115	S.F.	Stone Access Drive		
4	1	L.S.	20 L.F. of 28"x20" TDOT Standard Driveway Culvert, Including Pipe and Endwalls		
TOTAL, BID SCHEDULE 1					

Bid Schedule 2: Water System Construction

Item	Approx. Quantity		Description	Unit Price	Total Price
1	165	L.F.	12" Pressure Class 350 DIP Installed		
2	4,020	L.F.	12" C900 PVC Water Main Installed		
3	30	L.F.	24" Steel Casing Bored Across Roadway, 0.312" Wall Thickness		
4	150	L.F.	24" Steel Casing in Open Cut Across Future Crossings, 0.312" Wall Thickness		
5	1	L.S.	Cut In 12" M.J. Tee w/ (3) 12" On Grade C504 Butterfly Valves, Class 250B w/ Acutators, Boxes, Collars, Markers, and MegaLugs		

Item	Approx. Quantity		Description	Unit Price	Total Price
6	5	Each	12" On Grade: C504 Butterfly Valve, Class 250B w/ Actuator, Box, Collar, Marker, and MegaLugs		
7	1	Each	12" Tapping Sleeve and Valve w/ MegaLugs		
8	2	Each	12": Plug and Block Prop. Water Main for Future Connection		
9	2	Each	Fire Hydrant Assembly, Complete w/ 6" Control Valve, as Shown on Detail Sheet		
10	1	Each	Frost Proof Hydrant for Sampling on 3/4" PEXa Service Tubing		
11	1	Each	3/4" On Grade: Meter Assembly (Meter Furnished by the City; Installed by the Contractor), Including Direct Tap w/ Corp. Stop, Meter Box, and Yoke		
12	1	Each	3/4" Direct Tap w/ Corp. Stop		
13	65	L.F.	3/4" PEXa Service Tubing Installed in Open Cut		
14	1	L.S.	SCADA / Meter Base Panel Installation, Including Connection to 3/4" PEXa Service Tubing, Oil Pot, 3" Conduit, Meter Base, Circuit Panel, and Electrical Service Pole		
15	1	L.S.	Cedar St. Pump Replacement, as Detailed in the Specifications and Shown on the Drawings, Including - Removal of Exist. Pump - Furnishing and Mounting New Peerless 4AE11G Water Pump - Coupling and Aligning New Pump to the Exist. Motor in Accordance w/ Peerless Bulletin 2880549 - Furnishing and Installing New 6" Flanged Swing Check Valve		

TOTAL, BID SCHEDULE 2	

TOTAL BID, SCHEDULE 1 + SCHEDULE 2	

CONTRACTOR INFORMATION
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

Respectfully submitted,

Bidder	
Printed Name	
Signature	
Title	
Submittal Date	
Address for Giving Notices	
Telephone	
Fax	
Employer ID	
Contact Name	
Email Address	
Bidder's License No.	
Exp. Date	
Classification	

AGREEMENT
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

THIS AGREEMENT, made this [DATE] by and between the City of Tiptonville, Lake County, Tennessee hereinafter called "Owner" and [CONTRACTOR] a corporation organized in the State of [STATE], hereinafter called "Contractor".

WITNESSETH: That for and in consideration of the payments and agreements herein after mentioned:

1. The Contractor will commence and complete the construction of Contract 122 – DRA Water System Improvements to Support Sinova Global.

2. The Contractor will furnish all the materials, supplies, tools, equipment, labor, and other services necessary for the construction and completion of the PROJECT described herein.

3. The Contractor will commence the work required by the Contract Documents within 21 calendar days after the date of the Notice to Proceed and will complete same within 270 calendar days unless the period for completion is extended otherwise by the Contract Documents.

4. The Contractor agrees to perform all the Work described in the Contract Documents and comply with the terms therein for the sum shown in the Bid Proposal. The Total Contract Price is [PRICE] as shown in the Bid Proposal.

5. The term Contract Documents means and includes the following:
   A. Advertisement for Bids
   B. Bid Proposal
   C. Bid Bond
   D. Agreement
   E. General Conditions
   F. Payment Bond
   G. Performance Bond
   H. Notice of Award
   I. Notice to Proceed
   J. Specifications prepared and issued by Joel B. Spaulding & Company, Inc.
   K. Addenda _____ dated _____

6. The Owner will pay to the Contractor in the manner and at such times as set forth in the General Conditions such amounts as required by the Contract Documents.

7. This Agreement shall be binding upon all parties thereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed or caused to be executed by their duly authorized officials, the Agreement in three (3) copies each of which shall be deemed and original on the date first above written.

Owner: City of Tiptonville

By: _____

Name: Cliff Berry
Title: Mayor

(Seal)
Attest:

_____

Name:
Title: Secretary

Contractor:

By: _____

Name:
Title:

(Seal)
Attest:

_____

Name:
Title:

DETAILED SPECIFICATIONS AND CONTRACT DOCUMENTS
CONTRACT 122 – DRA WATER SYSTEM IMPROVEMENTS

GEOTECHNICAL ENGINEERING STUDY

CML
CONSTRUCTION MATERIALS LABORATORY, INC.

David M. Evans, P.E. **Matthew D. Evans, P.E.**

February 28, 2022

Mr. Bruce Spaulding, P.E.
Joel B. Spaulding & Company, Inc.
3322 West End Avenue, Suite 106
Nashville, TN 37203

Re: Soil Borings & Geotechnical Report
Tiptonville Elevated Water Tank – Old St. Route 22
Tiptonville, Tennessee

Dear Mr. Spaulding:

Enclosed are the results of a soil investigation and Geotechnical report for the proposed Elevated Water between State Route 22 and Old State Route 22 north of Tiptonville, Tennessee.

We appreciate the opportunity of performing the testing requirements on this project. If you have any questions concerning this report, please do not hesitate to call.

Yours truly,

Matthew D. Evans, P.E.
CONSTRUCTION MATERIALS LABORATORY, INC.

41 Heritage Square Jackson, Tennessee 38305
(731) 668-3585
Fax (731) 668-3586

TIPTONVILLE 250,000 GALLON ELEVATED WATER TANK

GEOTECHNICAL REPORT

OLD ST. RT. 22
LAKE COUNTY, TENNESSEE

Construction Materials Laboratory, Inc.
41 Heritage Square
Jackson, Tennessee 38305

Job No. 022206
February 2022

1. *INTRODUCTION*

1.1 Project Overview

This report prepared by Construction Materials Laboratory (CML) of Jackson, Tennessee, details the subsurface geotechnical investigation for the 250,000 elevated water tank north of Tiptonville, Tennessee. This report contains a description of the site conditions and recommendations based on the subsurface drilling.

The exact loading was not provided, however conservative estimates of factored maximum loads at full capacity are approximately 550-650 kips on each leg depending on the total number of legs for the tank.

2. *SITE CHARACTERISTICS*

2.1 Site Topography

The tank will be located on the wedge of land between Old State Route 22, and State Route 22, south of the Port of Cates Road, north of Tiptonville, Tennessee. This area slopes very slightly from north to south from elevation 306-302, and has a grass surface. The potential tank area begins south of the existing water line, parallel with Old State Route 22, beginning about 30 feet west of the west Right of Way. We anticipate very minor grading for the new water tank.

2.2 Geologic Profile and Seismic Parameters

This site is located within the Mississippi Embayment and the Tiptonville Dome. This area west of the river bluffs typically consists of shallow Holocene sediments of the Mississippi flood plain consisting of clays, silts, levee sands and occasionally gravels. The depth of the upper fine-grained deposits is typically based on the proximity to the Mississippi River, however this close to the river the profiles are erratic dur to erosion, and depths of fine-grained soils varies from 0-25 feet. However, all of Lake County was covered with sand blow deposits from the 1811-1812 earthquakes and are near surface in many areas. These quaternary fluvial sands and point bar sands tend to be poorly graded medium to fine quartz sands with relatively uniform subangular particle characteristics. The total depth of the quaternary soils ranges from 100-250 feet, underlain by Eocene sediments. The nearest source of seismic activity is the New Madrid Seismic Zone which surrounds this area, and is the most active seismic zone in the central and eastern United States.

Based on 0.01-degree grid spacing, ASCE 7-10 maps indicate a 0.2 second period spectral acceleration, S_s, of 2.801(g) and a 1.0 second period spectral acceleration, S_1, of 1.095 (g). A 100' deep boring was not conducted, however through the 60-foot depth with extrapolated average N value data to 100 feet; the site exhibits a depth weighted average N_{60} value of approximately 23-25 blows/ft over the upper 100 feet,

depending on energy corrections. An average energy ratio of 55% is generally assigned to our drill rig using a cat head rope and safety hammer. Based on the N values, as well as the soil characteristics the IBC site designation should be **Site Class D**.

2.3 Liquefaction Potential

This site is within the New Madrid Seismic Zone and large dynamic ground motions are possible, and soil liquefaction potential and cyclic softening are a significant concern. Widespread liquefaction occurred in this area during previous 1811-1812 earthquakes (Weathers & Van Arsdale, 2019 Vol. 7).

An analysis was performed using the commercially available software NovoLIQ (NovoTech Software) based on the method by Idriss and Boulanger (2004) for the Mapped MCE Geometric Mean Peak Ground Acceleration factored for site effects per IBC 2015 (ASCE 7-10) using the results of the soil investigation. The resulting ground motion for this site using the IBC 2012/2015 criteria is extremely high, and this analysis is considered conservative based on the low frequency of large ground motions. The summary of the inputs and results are presented in **Table 1**, and plots of the analysis are found in **Appendix D**. Commentary for the soil profile is below.

Sand Layers

The site has slightly loose, dry sand and silty sand from about 0-20 feet which are not susceptible to liquefaction, however would experience dry sand settlement. The sand from 20-25 feet is also not saturated, with increasing density, and has some potential for settlement after shaking. The deeper saturated sand from 25'+ exhibit medium dense conditions, with very low fines content, and are therefore susceptible to liquefaction during large ground motions. The depth intervals with the minimum safety factors against liquefaction are presented in Table 1 with the detailed reports presented in Appendix D. Potential for lateral spreading is considered minimal due to the flat site. The potential post-earthquake settlement of the current soil conditions (no improvement or foundation) is presented. The intermediate and deep foundation options would improve this site, and significantly reduce potential settlement.

Table 1. Liquefaction Analysis Results

Design Standard	PGA source	PGA_M (g)	Design Magnitude	Min. Safety Factor Against Liquefaction	Est. Max Post Earthquake Settlement of Current Site Conditions
ASCE 7-10	F_{PGA}*mapped PGA	1.8	7.5	No liquefaction 0-25' Dry FS = 0.15-0.25 from 25-50' FS = 0.2-0.4 from 50-60'	9-10"

2.4 Summary Subsurface Investigation

The subsurface investigation was conducted by performing soil borings with a hollow stem auger and subsequent Standard Penetration Tests (SPT) at specified depth intervals. The standard penetration test consists of counting the number of blows (N value) required for a 140-pound drop safety hammer falling 30 inches to cause a 2-inch O.D. split spoon sampler to penetrate the soil a distance of one foot in accordance with ASTM D – 1586.

Based on the scope of the project and the size of the site, 4 soil borings were performed, including 3 clustered around the preferred north end of the site. A schedule of the borings, including depth, location, elevation, groundwater levels and the depth of the borehole caving is shown in **Table 2** below. Detailed drilling logs for each boring are found in **Appendix A** as well as **Figure 2** which presents all of the SPT N values as a function of depth**.**

Table 2. Schedule of Soil Borings

Soil Boring	Boring Depth (ft)	Proposed Location	Approx. Elevation	Groundwater
B-1	50	North Tank Area – NW Perimeter	304.5	**27'**
B-2	60	North Tank Area – East Perimeter	304.5	Mud drilling started at 15'
B-3	50	North Tank Area – South Perimeter	304.5	Mud drilling started at 25'
B-4	50	Center Area	303.5	Mud drilling started at 15'

3. *SUBSOIL INVESTIGATION RESULTS*

3.1 Laboratory Testing Results

Soil samples recovered by the split spoon sampler were sealed and returned to the lab for further analysis. In addition to visual-manual classifications (ASTM D2488), each soil sample was tested for moisture content (ASTM D2216) and pocket penetrometer readings (PPR). Moisture content and pocket penetration values are located on the driller's logs in **Appendix A**.

Certain samples recovered by the split spoon sampler were further analyzed for Atterberg limits (ASTM D4318), grain size analysis (ASTM D6913 and D422) and classification according to the Unified Soils Classification System (USCS – ASTM D2487). The Atterberg limits consist of the liquid and plastic limits of the soil sample and are index tests that help to further characterize the nature of the soil. The liquid limit test is a dynamic shear test and represents the moisture at which the sample transitions from a plastic to a liquid

state and is directly controlled by the specific surface of the soil particles. The plastic limit represents the transition from a semisolid state to a plastic state and represents the lower boundary where the soil exhibits plastic behavior and can be deformed without volume change or cracking. All laboratory test results are found in **Appendix B**.

3.2 Soil Profile

Through the depths investigated the soil borings indicate three primary soil layers, denoted strata A-C. Soil strata and classifications are based on SPT results, visual-manual inspection of the recovered samples and Atterberg limits of selected samples.

Stratum A is composed of dry, slightly loose, gray, poorly graded sand (SP). SPT N values range from 5-14 blows/ft, slightly higher in the center of the site at B-4. This sand in fine is size, with average particle sizes, D_{50} of 0.2 mm. Fines content was only 4-5% and the recovered samples had no cohesion.

Stratum B begins around 8 feet, and is also a gray, fine sand layer, however some this sand has 10-35% low plasticity fines and is classified as silty sand (SM) and silty clayey sand (SC-SM). Even with the higher fines the recovered samples had no cohesion. SPT N values range from 10-25 blows/ft and the sand is conserved compact. The in-place water content ranges from 3-19%, indicating the lenses of slightly higher silt and clay.

Stratum C begins around 20-22 feet, and is a clean sand layer (SW, SP), however the SPT N values increase to an average of 28-33 blow/ft indicating medium dense conditions. The sand also becomes significantly coarser with a wider gradation, and an average particle size, D_{50} = 0.45 mm. This is a subrounded quartz sand with only 3-5% fines. This stratum extends through 60 feet.

3.3 Groundwater Levels

Groundwater levels were monitored throughout the course of drilling as well as at completion. Table 1 and the logs in Appendix A present the groundwater levels. Groundwater was measured in B-1 at a depth of approximately 27 feet (elevation 277-278). Due to the clean sand profile and the potential for sand blowing in the augers, mud drilling was initiated prior to groundwater in all other borings. Based on the clean sand profile, this appears to be a stable water level at the time of drilling, although fluctuations could occur with the Mississippi River levels.

4. *SITE FEASIBILITY*

4.1 Foundation Analysis from Subsoil Conditions

Based on the soil profile and the anticipated loading for this project, there are several options for the foundation. The area has a thick, clean sand profile, with increasing density with depth. The center of the site is similar to the north end. The center boring (B-4) had slightly higher N values in the top 25 feet, slightly lower N values from 25-35 feet, and slightly higher N values from 45-50 feet. These slightly sporadic patterns of N values are common in this type of profile and both the north and center sites would perform in a very similar manner, so for the purpose of the foundation design we will assume the north site will be used.

For this size tank under static conditions, large spread footings could support the loads with tolerable settlement, especially if the footing were buried 5+ feet deep with a 2-3-foot-thick limestone base layer installed below the footings. This option is discussed in detail in section 5.1 for comparison. However, the potential seismic motions in this area are so large, that if financially feasible we would strongly recommend a deep foundation or an intermediate foundation that would modify the upper 20-30 feet of the soil profile and reduce the risk during a large earthquake.

The intermediate foundation presented in Section 5.2 has been used by CML on several elevated water tanks as well as other large structures in seismic areas and can provide a very high bearing capacity for a typical spread footing, as well as increased protection from liquefaction and settlement. Installation time is low, and mobilization cost is often less than some deep foundation contractors.

The driven concrete pile option presented in section 5.3 is based on the beneficial installation effects of displacement piles in this type of loose to medium dense sand, the stiff response when loaded, and the availability of several West TN bridge contractors that routinely install these piles.

5. *FOUNDATION OPTIONS*

5.1 Shallow Foundation Design

Bearing Capacity, Embedment and Settlement: In this sand profile, a large square footing can provide significant bearing capacity using a moderate embedment depth and with a stiffer buffer layer to help better distribute stress. For this site, a footing with a bottom depth of at least 5 feet, with a 2-foot-thick layer of compacted limestone base directly below the footing could be designed for an allowable bearing stress of 3,200 psf. Based on the typical loading, we would assume a shallow footing with this bearing would have a size on the order of 14–16-foot square and would be heavily reinforced. Bearing capacity may be increased by 15% for temporary loading conditions such as wind and seismic. This allowable bearing capacity is based on a factor of safety of 4 for bearing failure (effective friction angle of 32° for the upper 15' of sand), as well as a calculated maximum total settlement of 1.2 inches under static loading. Maximum differential settlement is estimated to be less than 0.8 inches across the tank.

Inspections and Base Layer: Prior to placement of the reinforcing steel or concrete, the project geotechnical engineer or a technician working under the supervision of the engineer should inspect the excavated footing base. Every portion of excavated footings should be inspected regardless of similar soil characteristics from previously passed inspections. We would recommend over excavating the footing and installing at least 2 feet of crushed limestone base (Type A, Grading D) directly below the footing compacted in three lifts to at least 97% compaction of a standard proctor with a vibratory padfoot trench roller. This will provide a more stable surface for rebar installation, remove some of the upper loose sand, and better distribute stress across the footing. Due to the dry, clean sands, the sides of the footing will likely need to be sloped back to prevent caving during footing construction. The excavated material can be used for backfill, and should be compacted with a vibratory roller. The unit weight of the on-site sand can be taken as 105 lbs/ft^3.

Lateral Design: For lateral considerations we would recommend only using the base sliding resistance of the large footing. An allowable base sliding friction coefficient of 0.36 can be applied to the unfactored dead load. The sliding factor has already reduced with friction angle reduction of 0.9, and an overall safety factor of 1.5.

As previously mentioned, even with the high safety factor against general bearing failure, this foundation option has the highest risk during a seismic event and could experience significant post-earthquake settlement and tank displacement.

5.2 Intermediate (Geopier) Foundation

A good option that would allow for traditional shallow footings but with a much higher bearing capacity and reduced settlement is to use an intermediate foundation system, such as Geopiers. Geopier has several types of applications depending on the project and soil profile, and for this type of clean sand options would include either the GP3 system that is a traditional auger drilled hole (at this site casing would be needed) that is backfilled with heavily compacted stone lifts; or the Impact system, which eliminates the need for casing by using a driven mandrel and bottom feed for the stone lifts as the mandrel is retracted. Regardless of the system, each lift is compacted and increases the lateral stress of the surrounding soil, forming a stiffer soil matrix composed of extremely stiff aggregate piers and a stiffer surrounding natural soil between piers. Significant improvement is possible with this type of clean sand between the piers. The result of the Geopier installation is a reinforced zone of soil, and a top "engineered crust" stratum which allows the construction of a typical shallow footing sized for a higher bearing pressure or reduced upper zone settlement and provides significant resistance to liquefaction concerns. High strength threaded vertical rods with steel plates installed in the bottom of the Geopier and anchored in the concrete mat can also be used to provide significant uplift capacity for overturning moments. Footings on Geopiers also have increased lateral and sliding capacity as a result of the concentrated stress on the Geopiers combined with the high friction angle of the compacted limestone in the Geopiers compared with the surrounding soil. Geopiers are not necessarily designed to reach a high-end bearing stratum but have design lengths based on the size of the footing and settlement control. Following installation of all piers, the contractor can excavate and construct traditional shallow footings on top of the piers. Allowable bearing capacities of 6,000 -7,000 psf are possible with this type of sand with the installed piers. Table 3 presents average soil properties, although the full borings logs and lab tests should be reviewed prior to final design.

Geopier foundations are a proprietary foundation system and should be designed by Geopier Foundation Company, Inc and constructed by the licensed installer for this area. The regional engineer is Mr. Matt Dorsey, P.E. (870) 394-1041 mdorsey@geopier.com

Table 3. Average Soil Properties for Intermediate Foundation

Soil Layer and Depth from Current Ground	SPT N Values	Estimated Relative Density D_{50} and % fines (silt & clay)	Groundwater
Slightly Loose Dry Fine Sand with Silt (0-12')	5-12 blows/ft	40-50% / 0.25mm / 4-30%	Approximately 27'
Compact, Poorly Graded Fine Sand (12-22')	16-22 blows/ft	70% / 0.25 mm / 3-6%	
Med. Dense, Well Graded Coarse Sand (22-60')	29-50 blows/ft	75% / 0.45 mm / 2-4%	

5.3 Driven Concrete Pile Foundation

For a deep foundation option, we would recommend driven precast 14-inch square concrete piles. Based on the sand profile, this type of displacement pile will provide the most efficient design. Driven piles in this type of sand will cause some densification of the sand, provide a stiffer base response and usually have a lower equipment mobilization cost compared to augercast piles for this small amount of piling (we would assume 4-5 piles per column with a structural pile cap).

For this type of pile and this soil profile, the embedment depth will provide moderate-high end bearing, and moderate skin friction particularly under working loads. This office recommends an embedment depth of around 45 feet, which will place the bottom of the pile in medium dense sand and this length of pile should eliminate the need for a mechanical splice.

An embedment depth of 45 feet will provide an allowable vertical pile capacity of 86 tons, and an uplift capacity of 40 tons. Other values can be taken from **Figure 1** which presents the allowable pile capacity as a function of embedment depth. This analysis has applied a safety factor of 2 for the vertical skin friction; 3 for the end bearing; and 3 for uplift skin friction. For a conservative design the pile cap is assumed to carry no portion of the load and the embedment depth is referenced from the current subgrade elevation. For tank foundations using driven concrete piles; a total settlement of less than 0.5 inches is anticipated under working loads; and the results of the pile load test should be reviewed to ensure adequate capacity is achieved.

Lateral Loading: Lateral loading was not provided to CML at the time of this report, however based on the type of structure lateral shear loads could be present from earthquake and wind loading. A non-linear p-y analysis based on the site-specific soil profile was performed for a 14" square concrete pile. The lateral analysis assumes a fixed head condition, a rigid pile cap, a reduction for concrete cracking and steel reinforcement installed to a depth equal to or greater than the flexural length. A 45' embedment depth was used for this analysis based on the recommended vertical capacity. For a 45' embedment depth; a 14-inch square precast concrete pile can be designed for maximum allowable ground line shear of 17 kips per pile. This value is based on the IBC criteria of the finding the load causing a 1-inch lateral deflection then applying a safety factor of 2. For this load the pile flexural length can be taken as 15 feet. Beyond this depth the moment is minimal. A group reduction factor of 0.65 was applied to the lateral analysis based on the minimum recommended spacing.

Pile Spacing: Piles should have a minimum center-to-center pile spacing of at least 4 (equivalent) diameters. If piles are to be spaced closer this office should be contacted to revise pile capacities recommendations and analyze the foundation for a reduced vertical and lateral pile group efficiency.

Pile Hammer: A driving hammer with an energy rating of at least 21,000 ft-lbs and a ram weight of at least 6,500 lbs is recommended. A Single Acting hammer is considered appropriate for driving piles in the medium dense sand.

Test Pile: A minimum of 1 vertical test pile is recommended to evaluate the pile response and ensure adequate capacity. A quick load test according to ASTM D 1143 is recommended. Following the load test, the pile capacity and required embedment depth can be reviewed by the Geotechnical Engineer. The test pile should be allowed to setup for at least 4 days prior to the load test.

6. *INSPECTION AND CONTINGENCIES*

6.1 Inspection and Quality Control

All modifications to the site should be monitored and inspected by a competent technician. This includes excavations, undercutting, fill operations, and foundation preparation. Prior to fill placement; proposed on-site or haul in fill material should be evaluated for suitable attributes, and ASTM D-698 moisture density tests (Proctor tests) should be performed on every type of fill used on site. Moisture density tests of compacted fill should be checked at a minimum of 1 test per 2,000 square feet for each layer of compacted fill.

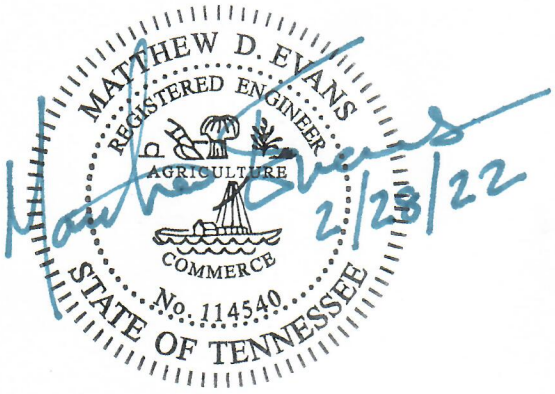
6.2 Contingencies and Limitations

All recommendations contained in this report are based on the interpretation of the subsurface soil boring investigation and current knowledge of the area. Although soil borings were conducted at relevant locations according to the proposed construction, it should be noted that the information obtained depicts the subsurface conditions at the specific boring locations at the particular time of the investigation. Although only minor deviations are expected, soil conditions could differ between boring locations as well as outside the area of the soil borings. Any significant deviations found during construction should be reported to this office in order to modify the geotechnical report and subsequent recommendations.

The scope of this report does not contain any environmental investigation or assessment of the site or any adjacent areas. This report does not address the corrosive potential or otherwise hazardous nature of any soil found in the exploration. Any statements contained in this report concerning the location or conditions of organic material are purely an assessment of the subsurface soil profile towards the evaluation of foundation treatment.

Any changes or revisions to the final plans of the elevated tank including loading conditions or locations of structures should be reported to this office in order to modify this report and the subsequent recommendations.

Report Submitted 28 February 2022



Matthew Evans

Registered Tennessee No. 114540

References

Weathers, T., & Van Arsdale, R. (2019 Vol. 7). Lake County, Tennessee, in the Heart of the New Madrid Seismic Zone. *Frontiers in Earth Science*, 1-20.

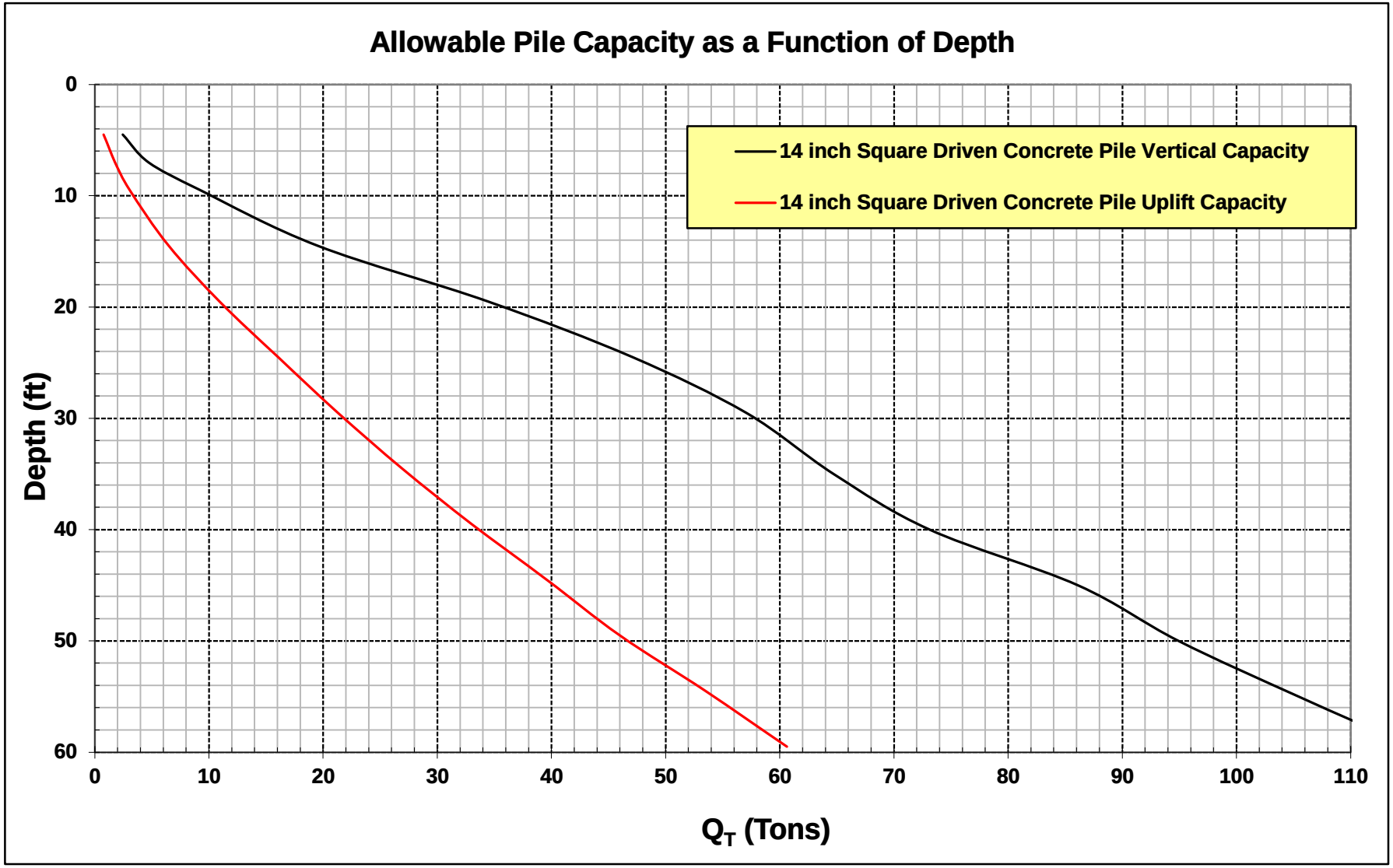
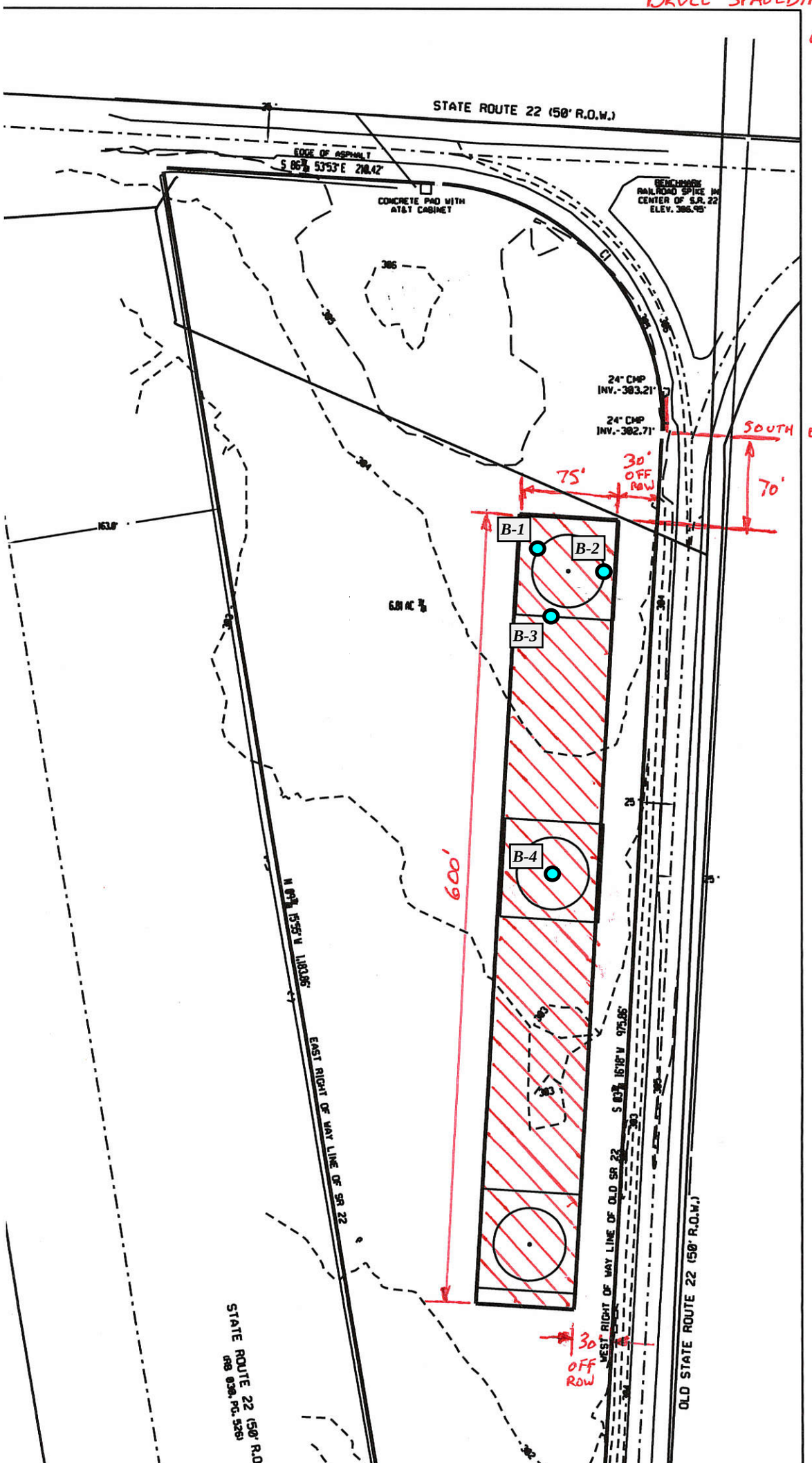


Figure 1. Vertical Capacity for 14 Inch Square Driven Concrete Piles
Tiptonville Elevated Water Tank, Old St. Rt 22, Tiptonville, TN

TIPTONVILLE ELEVATED TANK
BRUCE SPAULDING, P.E.
615-587-0721



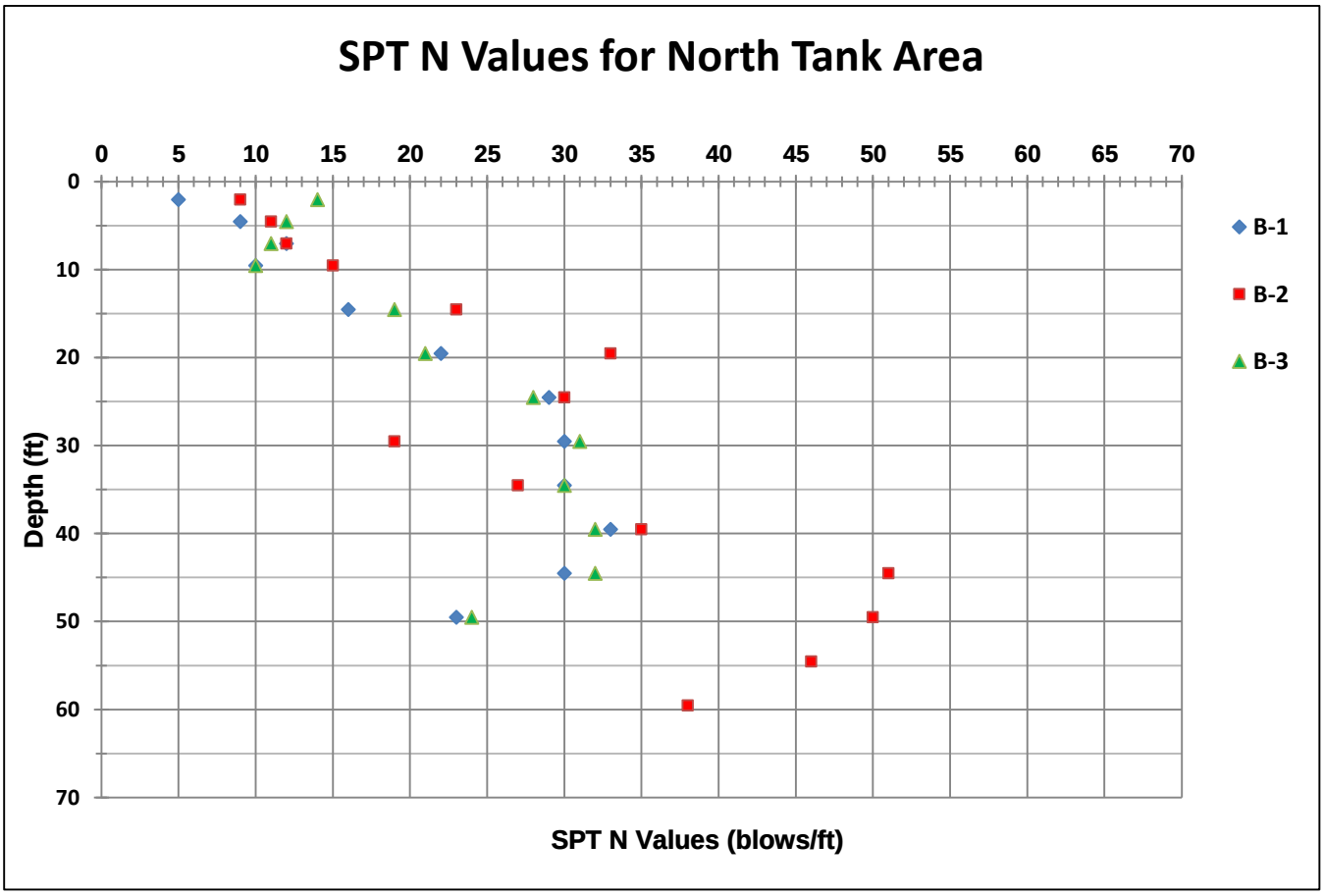
LOGS OF BORINGS

APPENDIX A

CML

CONSTRUCTION MATERIALS LABORATORY, INC.

Figure 2. Tiptonville Elevated Water Tank N values



41 Heritage Square Jackson, Tennessee 38305
(731) 668-3585 Fax(731) 668-3586

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-1-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
1	1.0	2.5			Brown sand	5	7		0.00
2	3.5	5.0			Brown sand	9	7		0.00
3	6.0	7.5			Brown sand	12	10		0.00
4	8.5	10.0			Brown sand	10	3		0.00
5	13.5	15.0			Grayish brown sand	16	3		0.00
6	18.5	20.0			Grayish brown sand	22	16		0.00
7	23.5	25.0			Brownish gray sand - trace of	29	15		0.00
					gravel				
8	28.5	30.0			Brownish gray sand	30	15		0.00
9	33.5	35.0			Brownish gray sand - trace of	30	26		0.00
					gravel				
10	38.5	40.0			Brownish gray sand	33	21		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Water 1st encountered at 27', mud rotary engaged at 30'

TESTING BORING RECORD

BORING No. 1 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-1-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
11	43.5	45.0			Brownish gray sand	30	19		0.00
12	48.5	50.0			Gray sand	23	18		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Water 1st encountered at 27', mud rotary engaged at 30'

_____

_____

TESTING BORING RECORD

BORING No. 1 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-21-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
1	1.0	2.5			Brown sand	9	12		0.00
2	3.5	5.0			Brown sand	11	3		0.00
3	6.0	7.5			Brown sand	12	5		0.00
4	8.5	10.0			Brown sand	15	5		0.00
5	13.5	15.0			Brown sand	23	3		0.00
6	18.5	20.0			Brown sand	33	23		0.00
7	23.5	25.0			Brown sand	30	16		0.00
8	28.5	30.0			Brown sand	19	20		0.00
9	33.5	35.0			Brown sand	27	18		0.00
10	38.5	40.0			Brown sand	35	22		0.00
11	43.5	45.0			Brown sand	51	20		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Mud rotary engaged at 15'

TESTING BORING RECORD

BORING No. 2 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-1-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
12	48.5	50.0			Brown sand	50	21		0.00
13	53.5	55.0			Brown & gray sand	46	18		0.00
14	58.5	60.0			Gray sand	38	17		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Mud rotary engaged at 15'

TESTING BORING RECORD

BORING No. 2 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-1-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____ AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
1	1.0	2.5			Brown sand	14	7		0.00
2	3.5	5.0			Brown sand	12	5		0.00
3	6.0	7.5			Brown sand	11	7		0.00
4	8.5	10.0			Brown sand	10	13		0.00
5	13.5	15.0			Grayish brown sand	19	3		0.00
6	18.5	20.0			Grayish brown sand	21	4		0.00
7	23.5	25.0			Brown sand	28	13		0.00
8	28.5	30.0			Brownish gray sand	31	18		0.00
9	33.5	35.0			Brownish gray sand	30	24		0.00
10	38.5	40.0			Brownish gray sand	32	22		0.00
11	43.5	45.0			Brownish gray sand - trace of	32	21		0.00
					gravel				

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Mud rotary engaged at 25'

TESTING BORING RECORD

BORING No. 3 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-1-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
12	48.5	50.0			Brownish gray sand	24	23		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Mud rotary engaged at 25'

TESTING BORING RECORD

BORING No. 3 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-21-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
1	1.0	2.5			Brown sandy clay/brown sand	15	11		0.00
2	3.5	5.0			Brown sand	13	7		0.00
3	6.0	7.5			Brown sand	13	7		0.00
4	8.5	10.0			Brown sand w/ clayey silt layers	15	19		0.00
5	13.5	15.0			Brown sand	25	3		0.00
6	18.5	20.0			Brown sand	39	16		0.00
7	23.5	25.0			Brown sand	32	15		0.00
8	28.5	30.0			Black & brown sand	13	25		0.00
9	33.5	35.0			Brown sand	23	18		0.00
10	38.5	40.0			Brown sand	35	21		0.00
11	43.5	45.0			Brown sand	67	21		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Mud rotary engaged at 15'

TESTING BORING RECORD

BORING No. 4 JOB No._____

Construction Materials Laboratory, Inc.

PROJECT TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 - LAKE COUNTY, TN

ELEVATION_____ DATE 2-21-22 WEATHER_____

WATER LEVEL AT FIELD ENGINEER_____

WATER LEVEL N/A AT Completion DRILLER Eddie Malone

WATER LEVEL_____ AT 24 HOURS

Sample No.	Sample Depth Feet From	To	Stratum Depth Feet From	To	Soil Classification	N	W	Qu	PPR
12	48.5	50.0			Brown sand	55	20		0.00

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: Mud rotary engaged at 15'

TESTING BORING RECORD

BORING No. 4 JOB No._____

Construction Materials Laboratory, Inc.

LABORATORY TEST RESULTS

APPENDIX B

CML

Construction Materials Laboratory, Inc.

Table B1. Tiptonville Elevated Water Tank Classification Summary

Boring	Sample Depth	Sample Type	Description	Coarse Sand %	Medium Sand %	Fine Sand %	Silt and Clay %	ATTERBERG LIMITS		USCS
								Liquid Limit	Plasticity Index	
B-4	3.5-5.0	SS	Gray Poorly Graded Sand	0.0	1.1	94.9	4.0	--	--	SP
B-1	6.0-7.5	SS	Gray Poorly Graded Sand	0.0	0.0	95.8	4.2	--	--	SP
B-4	8.5-10.0	SS	Gray Silty Sand	0.0	0.1	85.8	14.1	--	--	SM
B-3	8.5-10.0	SS	Gray Silty Clayey Sand	0.0	0.5	65.9	33.6	21	4	SC-SM
B-2	8.5-10.0	SS	Gray Poorly Graded Sand	0.0	0.2	97.1	2.7	--	--	SP
B-1	13.5-15.0	SS	Gray Poorly Graded Sand	0.0	1.5	95.4	3.1	--	--	SP
B-2	18.5-20.0	SS	Tan & Black Poorly Graded Sand w/ Silt	0.0	10.0	83.6	6.4	--	--	SP-SM
B-3	18.5-20.0	SS	Gray Poorly Graded Sand	0.0	20.2	76.9	2.9	--	--	SP
B-4	18.5-20.0	SS	Gray Silty Sand	0.0	6.2	75.5	18.3	--	--	SM
B-1	23.5-25.0	SS	Gray Well Graded Sand	0.0	54.8	41.8	3.4	--	--	SW
B-3	28.5-30.0	SS	Gray Well Graded Sand	2.4	61.7	34.4	1.5	--	--	SW
B-4	28.5-30.0	SS	Gray Well Graded Sand	2.0	50.0	43.0	5.0	--	--	SW
B-2	33.5-35.0	SS	Gray Well Graded Sand	11.0	45.0	40.4	3.6	--	--	SW
B-3	38.5-40.0	SS	Gray Well Graded Sand	0.0	46.9	49.2	3.9	--	--	SW
B-2	48.5-50.0	SS	Gray Poorly Graded Sand	0.0	65.5	30.8	3.7			SP

Notes:

* Classifications according to Unified Soil Classification System
LL = Liquid Limit and PI = Plasticity Index accrding to D ASTM 2487-06
Clay and Silt % fractions determined by material passing No. 200 sieve
Atterberg Limits were not performed on samples where the total fines content was less than 12%

SS - Split Sppon Sampler from Standard Penetration Testing
Shelby - Thin walled steel Shelby Tube pushed with weight of drill rig
Bulk - Large composite sample from Auger Trimmings over 5' depth interval

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Project: TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 – LAKE COUNTY, TN
Date: 2-7-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 1 SAMPLE # 3 DEPTH 6.0' – 7.5'

VISUAL DESCRIPTION OF SAMPLE: Gray poorly graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	0.0	Medium Sand
No. 40	No. 200	95.8	Fine Sand
No. 200	Pan	4.2	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SP

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Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 1 SAMPLE # 5 DEPTH 13.5' – 15.0'

VISUAL DESCRIPTION OF SAMPLE: Gray poorly graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	1.5	Medium Sand
No. 40	No. 200	95.4	Fine Sand
No. 200	Pan	3.1	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SP

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Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 1 SAMPLE # 7 DEPTH 23.5' – 25.0'

VISUAL DESCRIPTION OF SAMPLE: Gray well-graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	54.8	Medium Sand
No. 40	No. 200	41.8	Fine Sand
No. 200	Pan	3.4	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SW

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Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 2 SAMPLE # 4 DEPTH 8.5' – 10.0'

VISUAL DESCRIPTION OF SAMPLE: Gray Poorly Graded Sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	0.2	Medium Sand
No. 40	No. 200	97.1	Fine Sand
No. 200	Pan	2.7	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SP

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Date: 2-22-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 2 SAMPLE # 6 DEPTH 18.5' – 20.0'

VISUAL DESCRIPTION OF SAMPLE: Tan and Black Poorly Graded Sand with Silt

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	10.0	Medium Sand
No. 40	No. 200	83.6	Fine Sand
No. 200	Pan	6.4	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SP-SM

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Date: 2-22-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 2 SAMPLE # 9 DEPTH 33.5' – 35.0'

VISUAL DESCRIPTION OF SAMPLE: Gray well-graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	11.0	Coarse Sand
No. 10	No. 40	45.0	Medium Sand
No. 40	No. 200	40.4	Fine Sand
No. 200	Pan	3.6	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SW

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Date: 2-7-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 3 SAMPLE # 4 DEPTH 8.5' – 10.0'

VISUAL DESCRIPTION OF SAMPLE: Gray silty clayey sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	0.5	Medium Sand
No. 40	No. 200	65.9	Fine Sand
No. 200	Pan	33.6	Combined Silt & Clay

LIQUID LIMIT: 21

PLASTIC LIMIT: 17

PLASTICITY INDEX: 4

UNIFIED CLASSIFICATION: SC-SM

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Date: 2-7-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 3 SAMPLE # 6 DEPTH 18.5' – 20.0'

VISUAL DESCRIPTION OF SAMPLE: Gray poorly graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	20.2	Medium Sand
No. 40	No. 200	76.9	Fine Sand
No. 200	Pan	2.9	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SP

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Project: TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 – LAKE COUNTY, TN
Date: 2-7-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 3 SAMPLE # 8 DEPTH 28.5' – 30.0'

VISUAL DESCRIPTION OF SAMPLE: Gray well graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	2.4	Coarse Sand
No. 10	No. 40	61.7	Medium Sand
No. 40	No. 200	34.4	Fine Sand
No. 200	Pan	1.5	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SW

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Date: 2-7-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 3 SAMPLE # 10 DEPTH 38.5' – 40.0'

VISUAL DESCRIPTION OF SAMPLE: Gray well graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	46.9	Medium Sand
No. 40	No. 200	49.2	Fine Sand
No. 200	Pan	3.9	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SW

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Project: TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 – LAKE COUNTY, TN
Date: 2-22-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 4 SAMPLE # 2 DEPTH 3.5' – 5.0'

VISUAL DESCRIPTION OF SAMPLE: Gray poorly graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	1.1	Medium Sand
No. 40	No. 200	94.9	Fine Sand
No. 200	Pan	4.0	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SP

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David M. Evans, P.E. **Matthew D. Evans, P.E.**

Project: TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 – LAKE COUNTY, TN
Date: 2-22-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 4 SAMPLE # 4 DEPTH 8.5' – 10.0'

VISUAL DESCRIPTION OF SAMPLE: Gray silty sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	0.1	Medium Sand
No. 40	No. 200	85.8	Fine Sand
No. 200	Pan	14.1	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SM

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David M. Evans, P.E. **Matthew D. Evans, P.E.**

Project: TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 – LAKE COUNTY, TN
Date: 2-22-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 4 SAMPLE # 6 DEPTH 18.5' – 20.0'

VISUAL DESCRIPTION OF SAMPLE: Gray silty sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	6.2	Medium Sand
No. 40	No. 200	75.5	Fine Sand
No. 200	Pan	18.3	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SM

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Project: TIPTONVILLE ELEVATED WATER TANK - OLD HWY. 22 – LAKE COUNTY, TN
Date: 2-22-22
Lab No.:

Analysis of **SOIL CLASSIFICATION & PHYSICAL TEST CONSTANTS**
Contractor
Producer
Reported To

BORING # 4 SAMPLE # 8 DEPTH 28.5' – 30.0'

VISUAL DESCRIPTION OF SAMPLE: Gray well-graded sand

SIEVE ANALYSIS

PASSING	RETAINED ON	PERCENT	CHARACTERISTICS
No. 4	No. 10	2.0	Coarse Sand
No. 10	No. 40	50.0	Medium Sand
No. 40	No. 200	43.0	Fine Sand
No. 200	Pan	5.0	Combined Silt & Clay

LIQUID LIMIT: NP

PLASTIC LIMIT: NP

PLASTICITY INDEX: NP

UNIFIED CLASSIFICATION: SW

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LIQUEFACTION ANALYSIS

APPENDIX D

Liquefaction Analysis Results

Construction Materials Laboratory

Job Title : Tiptonville Elevated Water Tank
Job No. : 022206
Client : B. Spaulding
Address : Lake County TN
Calculated By : M. Evans Reviewed By :

Borehole : BH-1,2,3
Coordinates:
X = 0
Y = 0
Z = 0

Input Assumption	Setting
Field Test Type :	Standard Penetration Test (SPT)
Apply All Corrections to SPT?	True
Groundwater Level (ft) =	27
Earthquake Magnitude M =	7.5
Magnitude Scaling Factor (MSF) :	Function of depth (Idriss, 1999 - Golesor
Fines Content Correction :	(according to user settings)
Depth Reduction Factor (Rd) :	Idriss 1999, Golesorkhi 1989
Relative Density (Dr) Estimation :	Idriss & Boulanger, 2003
Site Topography :	Gently Sloped : 0.1 %
Ground Improvement Feature :	None
Peak Ground Acceleration PGA (g) =	1.8

CRR Formula	Selected?
NCEER Workshop (1997)	False
Boulanger & Idriss (2004)	True
Vancouver Task Force (2007)	False
Cetin et al. (2004)	False
Chinese Code	False
Seed et al. (1983)	False
Japanese Highway Bridge Code	False
Tokimatsu & Yoshimi (1983)	False
Shibata (1981)	False
Kokusho et al. (1983)	False

Depth (ft)	SPT Blow Counts (N)
2	10
4.5	11
7	12
9.5	12
14.5	19
19.5	25
24.5	29
29.5	27
34.5	29
39.5	33
44.5	38
49.5	32
54.5	46
59.5	38
64.5	42

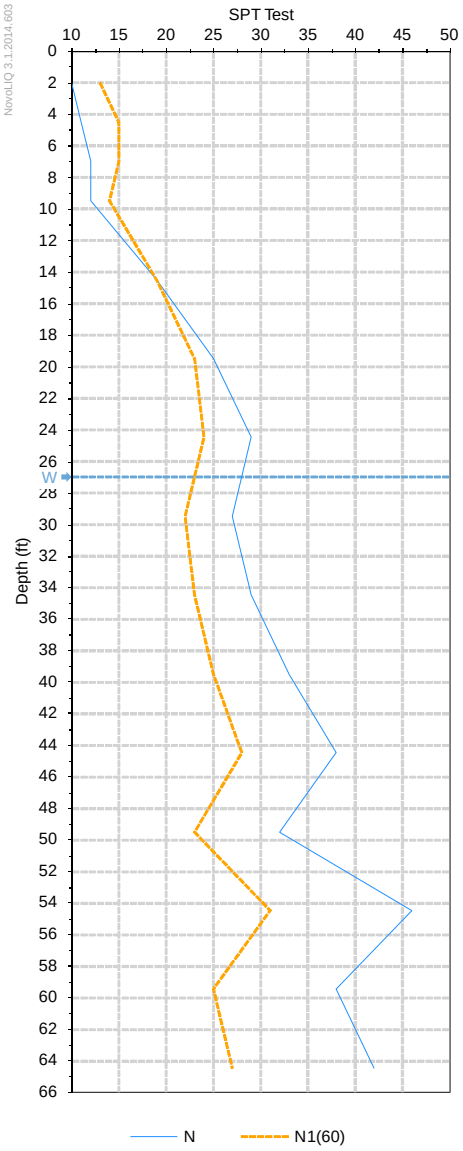
Layer Thickness (ft)	Soil Type	Unit Weight (lb/ft3)	Fines Content (%)	D50 (mm)	Check Liquefaction/ S	Su (ksf)
8	Sand	110	4	0.25	True	0
14	Sand	115	10	0.25	True	0
43	Sand	120	4	0.45	True	0

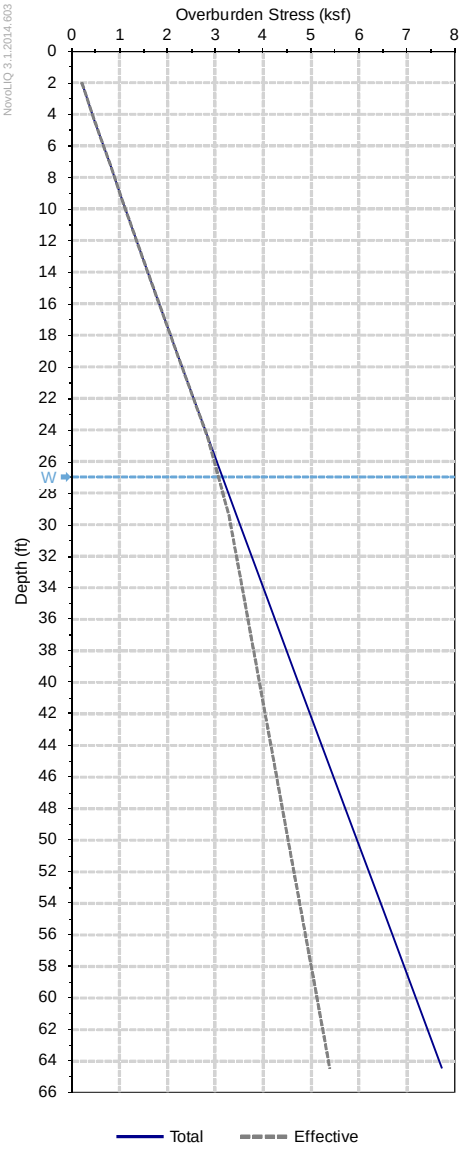
Liquefaction Analysis Results

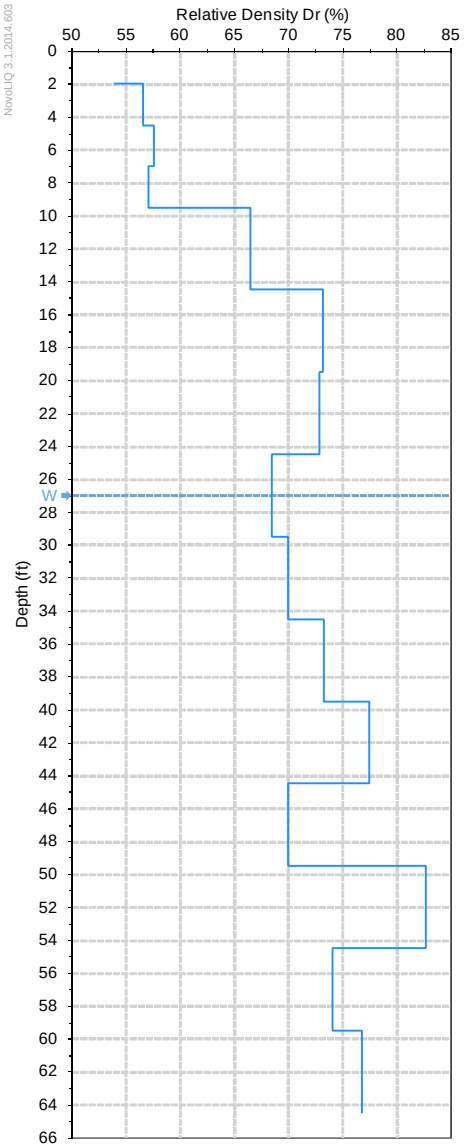
Construction Materials Laboratory

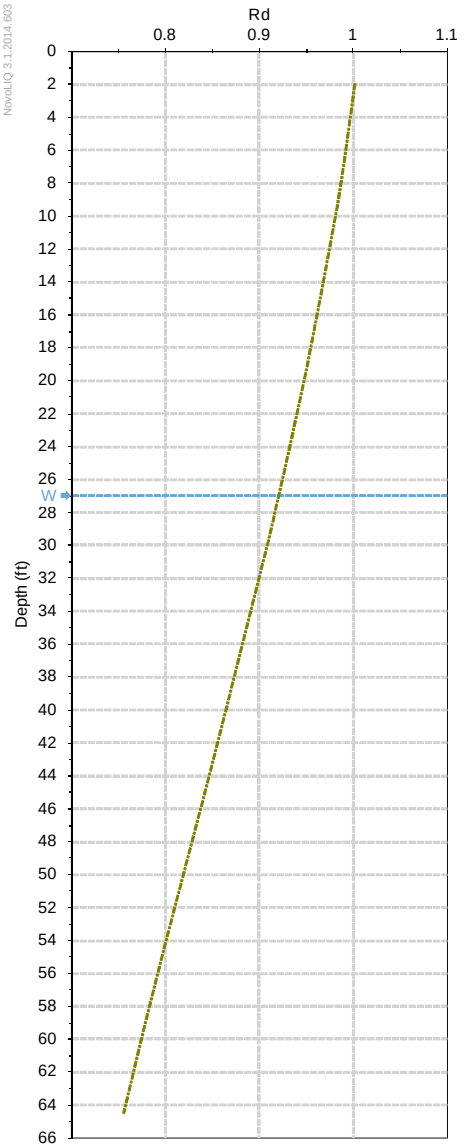
Job Title : Tiptonville Elevated Water Tank
Job No. : 022206
Client : B. Spaulding
Address : Lake County TN
Calculated By : M. Evans Reviewed By :

Borehole : BH-1,2,3
Coordinates:
X = 0
Y = 0
Z = 0







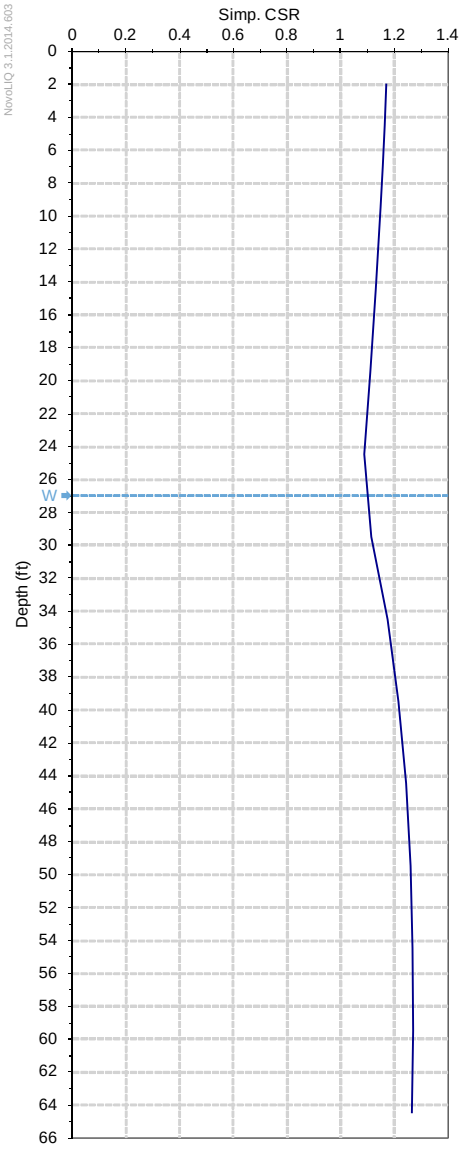


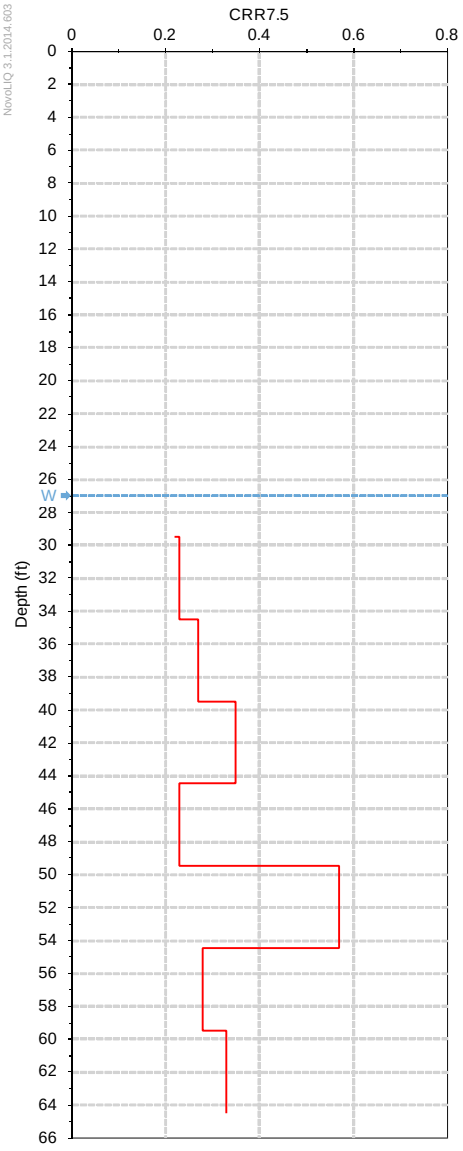
Liquefaction Analysis Results

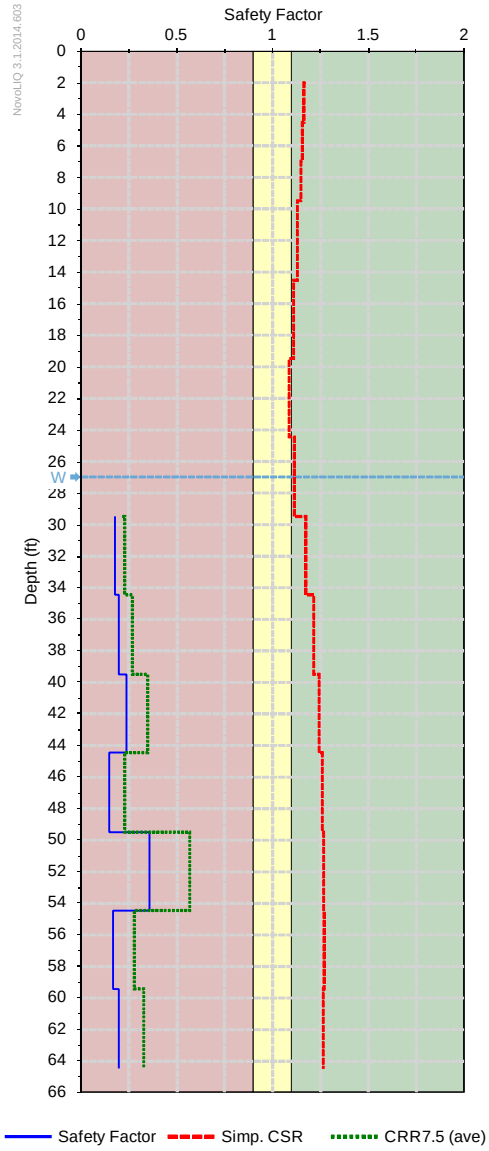
Construction Materials Laboratory

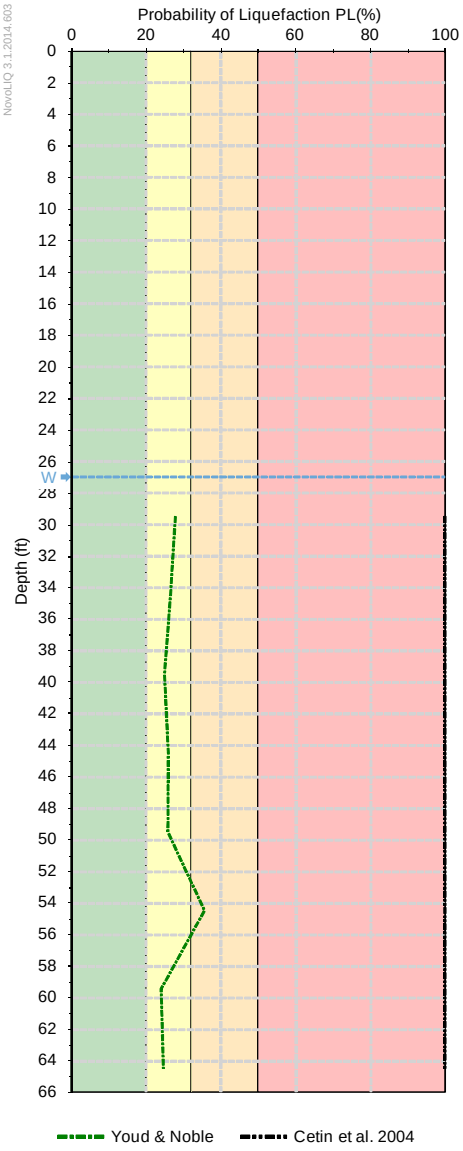
Job Title : Tiptonville Elevated Water Tank
Job No. : 022206
Client : B. Spaulding
Address : Lake County TN
Calculated By : M. Evans Reviewed By :

Borehole : BH-1,2,3
Coordinates:
X = 0
Y = 0
Z = 0







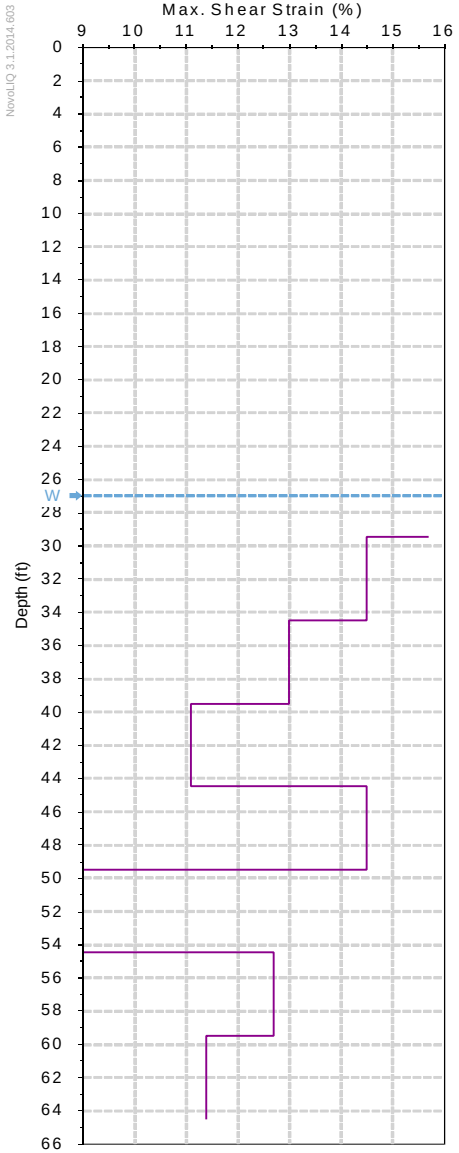


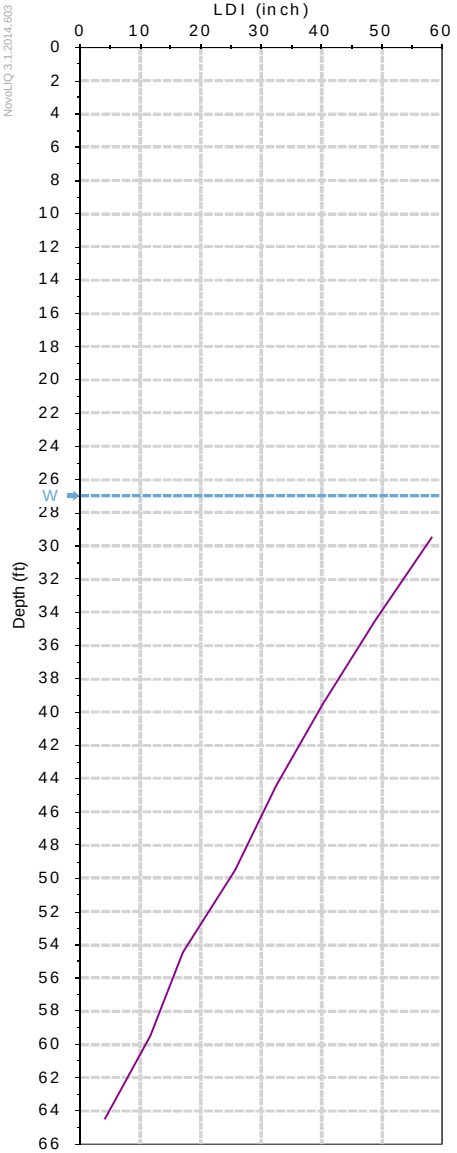
Liquefaction Analysis Results

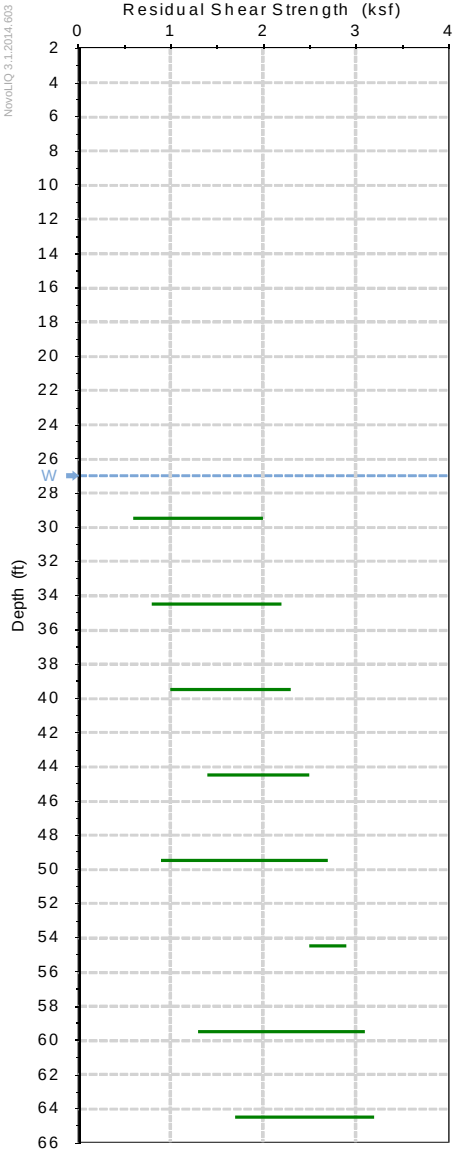
Construction Materials Laboratory

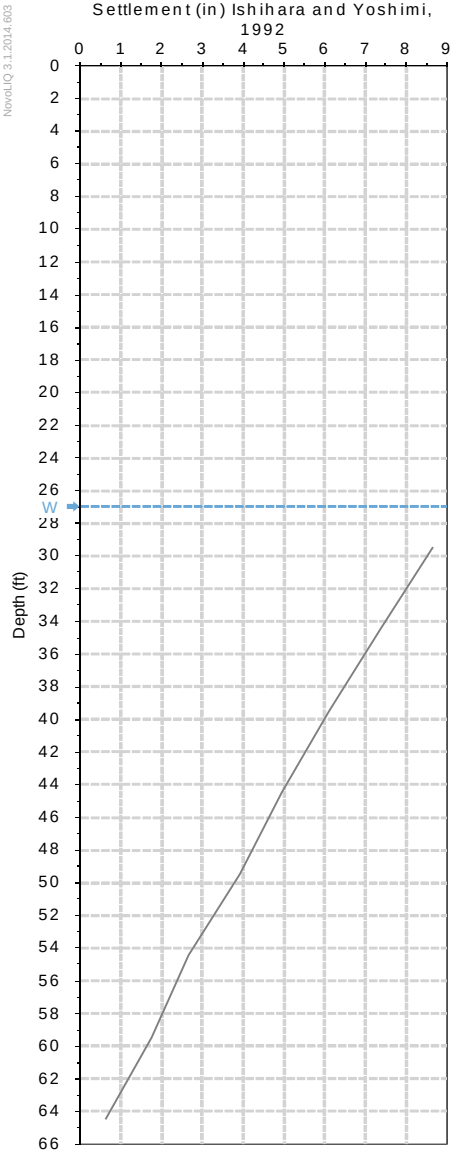
Job Title : Tiptonville Elevated Water Tank
Job No. : 022206
Client : B. Spaulding
Address : Lake County TN
Calculated By : M. Evans Reviewed By :

Borehole : BH-1,2,3
Coordinates:
X = 0
Y = 0
Z = 0

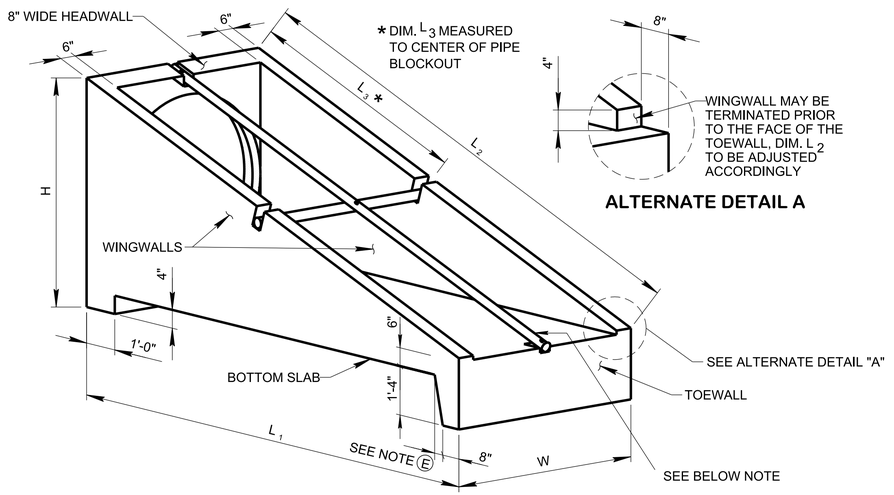








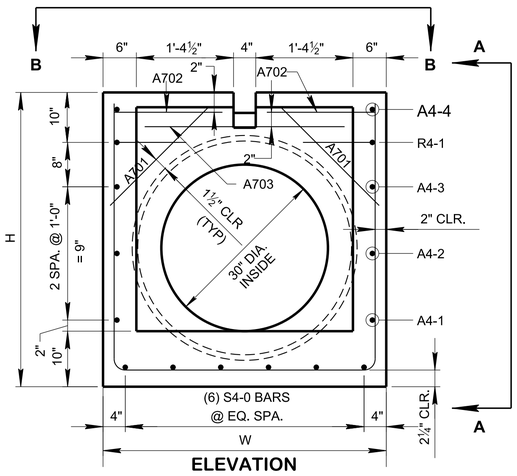
TDOT STANDARD PIPE CULVERTS AND ENDWALLS



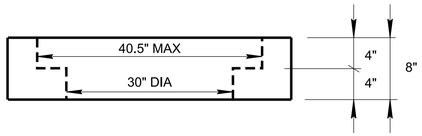
ISOMETRIC VIEW

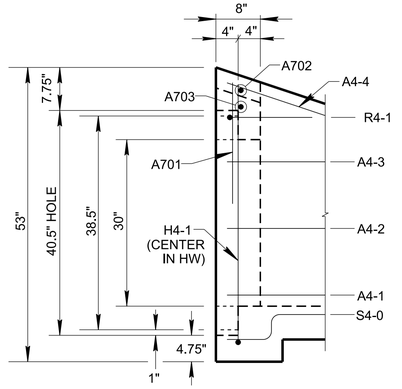
NOTES: SEE D-PE-99 FOR STEEL PIPE GRATE DETAILS
¾" CHAMFER REQUIRED ON ALL EXPOSED EDGES

ALTERNATE DETAIL A



ELEVATION





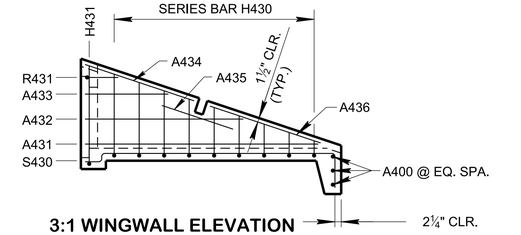
PARTIAL VIEW A-A

HEADWALL DETAILS

NOTES: INSTALL BARS A701 AT 45°
SEE GENERAL NOTES Ⓒ & Ⓕ

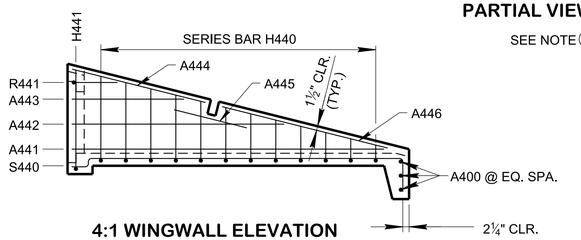
PARTIAL VIEW B-B

SEE NOTE Ⓕ



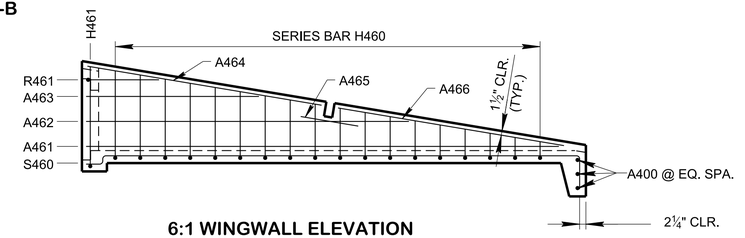
3:1 WINGWALL ELEVATION

NOTE: A-BARS IN HEADWALL NOT SHOWN FOR CLARITY.



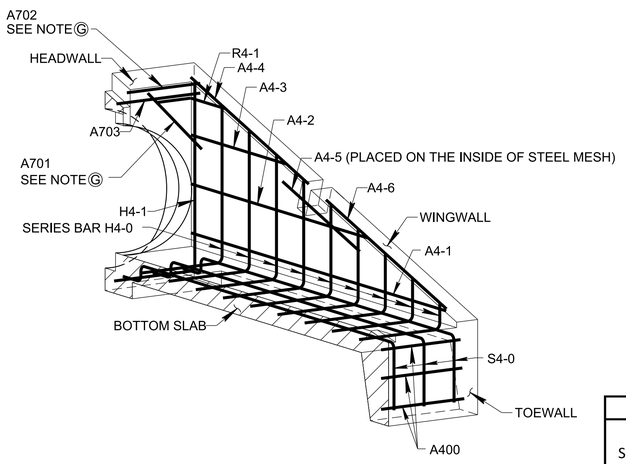
4:1 WINGWALL ELEVATION

NOTE: A-BARS IN HEADWALL NOT SHOWN FOR CLARITY.



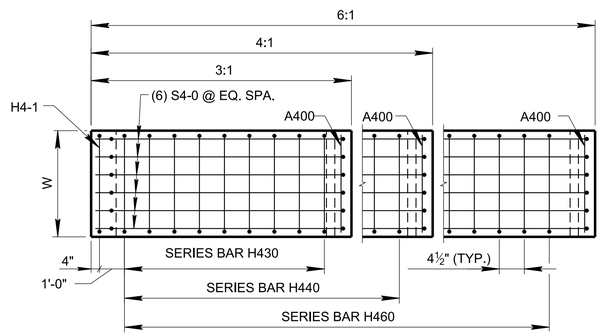
6:1 WINGWALL ELEVATION

NOTE: A-BARS IN HEADWALL NOT SHOWN FOR CLARITY.



ISOMETRIC HALF-SECTION SHOWING REINFORCEMENT

(3:1 SHOWN, 4:1 & 6:1 SIMILAR)
SEE GENERAL NOTE Ⓒ



BOTTOM SLAB PLAN

DIMENSIONS AND QUANTITIES FOR ONE ENDWALL 30" PIPE

SLOPE	CONCRETE ENDWALL DIMENSIONS					STRUCTURAL STEEL PIPE DIMENSIONS		ESTIMATED QUANTITIES		
	H	L_1	L_2	L_3	W	LG	WG	CLASS "A" CONC. CU. YD.	STEEL BAR REINF. LB.	STRUCTURAL STEEL LB.
3:1	4' - 5"	10' - 5"	10' - 11 ¾"	5' - 2"	4' - 1"	10' - 10 ⅝"	4' - 1"	1.84	174	114
4:1		13' - 8"	14' - 1"	6' - 1"		14' - 0 ⅛"		2.32	216	137
6:1		20' - 2"	20' - 5 ⅜"	10' - 1"		20' - 4 ¾"		3.29	303	186

NOTE: SEE D-PE-99 FOR STRUCTURAL STEEL PIPE DIMENSIONS LG & WG.

GENERAL NOTES

Ⓐ DRAWING TO BE USED FOR ALL CAST-IN-PLACE AND ALL PRECAST 30" CONCRETE ENDWALLS (TYPE "U") FOR CROSS DRAINS ONLY. "U" ENDWALL TO BE PLACED AT 90° SKEW TO CENTERLINE. SEE STD. DWG. D-PE-99 FOR SKEWED CONNECTION DETAIL WHEN CROSS DRAIN IS NOT PERPENDICULAR TO CENTERLINE. CAST-IN-PLACE CONCRETE ENDWALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS, SECTION 611 AND/OR SPECIAL PROVISIONS.

Ⓑ SEE STD. DWG. D-PE-30B FOR BILL OF STEEL & PRECAST NOTES.

Ⓒ "-" IN BAR DESIGNATION REPRESENTS 3, 4 OR 6 FOR 3:1, 4:1 OR 6:1 SLOPES, RESPECTIVELY.

Ⓓ SPLICING OF REINFORCEMENT IS ACCEPTABLE PROVIDED THAT A MINIMUM 21" SPLICE LENGTH IS USED.

Ⓔ TOEWALL BACK SLOPE MAY BE CONSTRUCTED VARIABLE FROM VERTICAL UP TO 15°.

Ⓕ 90° STEPS ARE SHOWN ON THE STEPPED HOLE DETAIL, HOWEVER MINOR VARIATIONS OF THE TAPER ARE ACCEPTABLE.

Ⓖ OPTIONAL STEPPED HOLE OR HOLE FORMERS ARE ALLOWED PROVIDED THE AMOUNT OF COVER BETWEEN THE PIPE OPENING AND BARS A701 AND A702 IS THE SAME OR GREATER THAN SHOWN ON THIS DRAWING.

Ⓗ PAYMENT WILL BE MADE UNDER:

611-07.60	30" ENDWALL (CROSS DRAIN) 3:1	EACH
611-07.61	30" ENDWALL (CROSS DRAIN) 4:1	EACH
611-07.62	30" ENDWALL (CROSS DRAIN) 6:1	EACH

Ⓘ THE CONTRACTOR MAY BE ELECT TO SUBSTITUTE AN APPROVED ALTERNATIVE DESIGN.

Ⓙ DIMENSIONAL AND REINFORCING TOLERANCES WILL BE AS SHOWN IN STANDARD OPERATING PROCEDURE (SOP) 5-3.

- REV. 6-14-13: REVISED NOTE Ⓖ. ADDED NOTE Ⓗ AND Ⓘ.
- REV. 1-6-15: REVISED HOLE OPENING SIZE. ADDED STEPPED HOLE DETAIL.
- REV. 1-21-16: REVISED GENERAL NOTE Ⓑ.
- REV. 10-10-16: REVISED GENERAL NOTE Ⓐ.
- REV. 06-28-19: ADJUSTED A-A, B-B AND ELEVATION VIEWS. RENAMED AND REDREW SHEET.

- MINOR REVISION -- FHWA APPROVAL NOT REQUIRED

STATE OF TENNESSEE
STANDARD DRAWING
DEPARTMENT OF TRANSPORTATION

TYPE "U" CROSS DRAIN ENDWALL FOR 30" PIPE WITH STEEL PIPE GRATE (FOR 3:1, 4:1 & 6:1 SLOPES)

03-01-2012 | D-PE-30A

NOT TO SCALE

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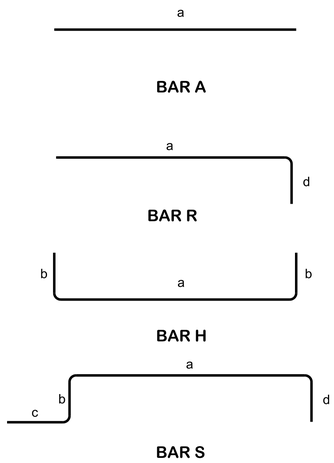
REV. 06-28-19: RENAMED AND REDREW SHEET.

BILL OF STEEL

CODE NO.	LOCATION	BAR SIZE	3:1 WINGWALL SLOPE						4:1 WINGWALL SLOPE						6:1 WINGWALL SLOPE					
			BENDING DIMENSIONS				NO. REQ'D	LENGTH	BENDING DIMENSIONS				NO. REQ'D	LENGTH	BENDING DIMENSIONS				NO. REQ'D	LENGTH
			a	b	c	d			a	b	c	d			a	b	c	d		
A400	TOEWALL	4	3' - 9"	-	-	-	3	3' - 9"	3' - 9"	-	-	-	3	3' - 9"	3' - 9"	-	-	-	3	3' - 9"
A431	WINGWALLS	4	9' - 4"	-	-	-	2	9' - 4"	-	-	-	-	-	-	-	-	-	-	-	-
A432	WINGWALLS	4	6' - 4"	-	-	-	2	6' - 4"	-	-	-	-	-	-	-	-	-	-	-	-
A433	WINGWALLS	4	3' - 4"	-	-	-	2	3' - 4"	-	-	-	-	-	-	-	-	-	-	-	-
A434	WINGWALLS	4	4' - 7"	-	-	-	2	4' - 7"	-	-	-	-	-	-	-	-	-	-	-	-
A435	WINGWALLS	4	3' - 0"	-	-	-	2	3' - 0"	-	-	-	-	-	-	-	-	-	-	-	-
A436	WINGWALLS	4	4' - 9"	-	-	-	2	4' - 9"	-	-	-	-	-	-	-	-	-	-	-	-
A441	WINGWALLS	4	-	-	-	-	-	-	12' - 6"	-	-	-	2	12' - 6"	-	-	-	-	-	-	-
A442	WINGWALLS	4	-	-	-	-	-	-	8' - 6"	-	-	-	2	8' - 6"	-	-	-	-	-	-	-
A443	WINGWALLS	4	-	-	-	-	-	-	4' - 6"	-	-	-	2	4' - 6"	-	-	-	-	-	-	-
A444	WINGWALLS	4	-	-	-	-	-	-	5' - 6"	-	-	-	2	5' - 6"	-	-	-	-	-	-	-
A445	WINGWALLS	4	-	-	-	-	-	-	3' - 0"	-	-	-	2	3' - 0"	-	-	-	-	-	-	-
A446	WINGWALLS	4	-	-	-	-	-	-	6' - 11"	-	-	-	2	6' - 11"	-	-	-	-	-	-	-
A461	WINGWALLS	4	-	-	-	-	-	-	-	-	-	-	-	-	18' - 11"	-	-	-	2	18' - 11"
A462	WINGWALLS	4	-	-	-	-	-	-	-	-	-	-	-	-	12' - 11"	-	-	-	2	12' - 11"
A463	WINGWALLS	4	-	-	-	-	-	-	-	-	-	-	-	-	6' - 11"	-	-	-	2	6' - 11"
A464	WINGWALLS	4	-	-	-	-	-	-	-	-	-	-	-	-	9' - 6"	-	-	-	2	9' - 6"
A465	WINGWALLS	4	-	-	-	-	-	-	-	-	-	-	-	-	3' - 0"	-	-	-	2	3' - 0"
A466	WINGWALLS	4	-	-	-	-	-	-	-	-	-	-	-	-	9' - 2"	-	-	-	2	9' - 2"
A701	HEADWALL	7	2' - 0"	-	-	-	2	2' - 0"	2' - 0"	-	-	-	2	2' - 0"	2' - 0"	-	-	-	2	2' - 0"
A702	HEADWALL	7	1' - 6 ½"	-	-	-	2	1' - 6 ½"	1' - 6 ½"	-	-	-	2	1' - 6 ½"	1' - 6 ½"	-	-	-	2	1' - 6 ½"
A703	HEADWALL	7	3' - 0"	-	-	-	1	3' - 0"	3' - 0"	-	-	-	1	3' - 0"	3' - 0"	-	-	-	1	3' - 0"
SERIES H430	BOTTOM SLAB & WINGWALL	4	3' - 9"	*	-	-	1	67' - 6"	-	-	-	-	-	-	-	-	-	-	-	-
			* DIMENSION "b" VARIES FROM 3'-2 ½" TO 0'-6 ½" IN INCREMENTS OF 0'-4" (9 BARS)																	
H431	BOTTOM SLAB & HEADWALL	4	3' - 9"	3' - 10 ½"	-	-	1	11' - 6"	-	-	-	-	-	-	-	-	-	-	-	-
SERIES H440	BOTTOM SLAB & WINGWALL	4	-	-	-	-	-	-	3' - 9"	*	-	-	1	91' - 9"	-	-	-	-	-	-
									* DIMENSION "b" VARIES FROM 3'-3 ⅞" TO 0'-6 ⅞" IN INCREMENTS OF 0'-3" (12 BARS)											
H441	BOTTOM SLAB & HEADWALL	4	-	-	-	-	-	-	3' - 9"	3' - 10 ⅞"	-	-	1	11' - 6 ¾"	-	-	-	-	-	-
SERIES H460	BOTTOM SLAB & WINGWALL	4	-	-	-	-	-	-	-	-	-	-	-	-	3' - 9"	*	-	-	1	140' - 3"
															* DIMENSION "b" VARIES FROM 3'-5 ¼" TO 0'-7 ¾" IN INCREMENTS OF 0'-2" (18 BARS)					
H461	BOTTOM SLAB & HEADWALL	4	-	-	-	-	-	-	-	-	-	-	-	-	3' - 9"	3' - 11 ¼"	-	-	1	11' - 7 ½"
R431	HEADWALL & WINGWALL	4	1' - 4"	1' - 0"	-	-	2	2' - 4"												
R441	HEADWALL & WINGWALL	4							1' - 10"	1' - 0"	-	-	2	2' - 10"						
R461	HEADWALL & WINGWALL	4													2' - 11"	1' - 0"	-	-	2	3' - 11"
S430	BOTTOM SLAB & TOEWALL	4	9' - 4 ½"	0' - 4 ½"	0' - 8"	1' - 5"	6	11' - 10"	-	-	-	-	-	-	-	-	-	-	-	-
S440	BOTTOM SLAB & TOEWALL	4	-	-	-	-	-	-	12' - 7 ½"	0' - 4 ½"	0' - 8"	1' - 5"	6	15' - 1"	-	-	-	-	-	-
S460	BOTTOM SLAB & TOEWALL	4	-	-	-	-	-	-	-	-	-	-	-	-	19' - 1 ½"	0' - 4 ½"	0' - 8"	1' - 5"	6	21' - 7"

REINFORCING STEEL LEGEND



REINFORCING STEEL CODE

TYPE	SIZE	SERIES
A	5	06

DIMENSIONS SHOWN ON THIS SHEET ARE OUTSIDE TO OUTSIDE OF BAR.

STANDARD C.R.S.I. HOOK DETAILS SHALL APPLY, EXCEPT AS NOTED.

PRECAST NOTES

PRECAST UNITS:

THE CONTRACTOR MAY, WITH PERMISSION FROM THE ENGINEER, SUBSTITUTE PRECAST ENDWALLS FOR CAST-IN-PLACE ENDWALLS PROVIDED THAT;

1. APPROPRIATE SIZING AND LOCATION OF THE LIFTING INSERTS SHALL BE THE RESPONSIBILITY OF THE FABRICATOR TO ASSURE BALANCED HANDLING DURING INSTALLATION OF THE PRECAST ENDWALL.
2. THE CONTRACTOR TO PATCH ALL LIFTING INSERT HOLES AND PLACE A MINIMUM OF ONE (1) INCH OF COVER OVER THE HARDWARE OF THESE DEVICES ON BOTH TOP AND BOTTOM SURFACES.
3. PAYMENT FOR PRECAST ENDWALLS BASED ON THE QUANTITIES FOR CAST-IN-PLACE ENDWALLS IS ACCEPTABLE.
4. PRECAST ENDWALL UNITS WHICH ARE DAMAGED DURING SHIPMENT OR INSTALLATION WILL BE REJECTED. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPLACE THE DAMAGED ENDWALL UNITS AT HIS OWN EXPENSE.
5. PIPE OPENINGS FOR HEADWALLS ARE BASED ON REINFORCED CONCRETE PIPE WITH TYPE "B" WALL THICKNESS (AASHTO M170).
6. ADDITIONAL REINFORCING STEEL NECESSARY TO MAINTAIN THE INTEGRITY OF THE STRUCTURE DURING HANDLING AND PLACEMENT SHALL BE THE RESPONSIBILITY OF THE FABRICATOR.

CONCRETE: Fc'=4,500 POUNDS PER SQUARE INCH MINIMUM AT 28 DAYS.
REINFORCING STEEL: ASTM A615, Fy=60,000 POUNDS PER SQUARE INCH.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED

STATE OF TENNESSEE
STANDARD DRAWING
DEPARTMENT OF TRANSPORTATION

TYPE "U"
CROSS DRAIN ENDWALL FOR 30" PIPE,
BILL OF STEEL AND PRECAST NOTES

03-01-2012 | D-PE-30B

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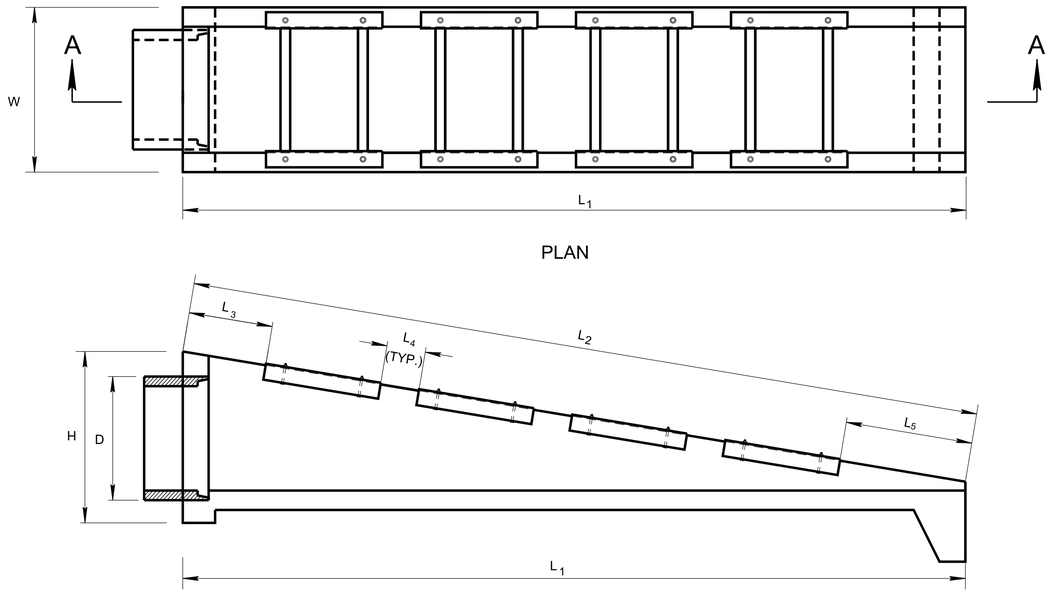


SIDE DRAIN DIA. (D)	DIMENSIONS AND QUANTITIES FOR ONE ENDWALL									
	CONCRETE ENDWALL DIMENSIONS				GRATE PLACEMENT DIMENSIONS			STRUCTURAL STEEL GRATE DIMENSIONS AND QUANTITY		STRUCT. STEEL
	H	W	L_1	L_2	L_3	L_4	L_5	WG	NO. REQ'D.	LB.
15"	SEE STD. DWG. D-PE-15A				2'-2"	1'-0"	2'-1⅞"	2'-5"	2	172
18"	SEE STD. DWG. D-PE-18A				10⅛"	1'-0"	1'-0"	2'-8"	3	269
24"	SEE STD. DWG. D-PE-24A				2'-2"	1'-0"	3'-2⅝"	3'-3"	3	296
30"	SEE STD. DWG. D-PE-30A				2'-2"	1'-0"	3'-3⅜"	3'-10"	4	694
36"	SEE STD. DWG. D-PE-36A				2'-2"	1'-0"	2'-9⅞"	4'-5"	5	975
42"	SEE STD. DWG. D-PE-42A				2'-2"	1'-0"	1'-10⅜"	5'-0"	6	1,300
48"	SEE STD. DWG. D-PE-48A				2'-2"	1'-0"	1'-5"	5'-7"	7	1,669

NOTE:
BOLTS SHALL NOT EXTEND MORE THAN ½" ABOVE TOP OF NUTS.

GENERAL NOTES

(A) DRAWING TO BE USED FOR ALL 15" THRU 48" SIDE DRAIN CONCRETE ENDWALLS. REFER THE FOLLOWING STANDARD DRAWINGS FOR CONSTRUCTION DIMENSIONS.

15" ENDWALL - SEE D-PE-15A & D-PE-15B WITH 6:1 WINGWALL SLOPE
18" ENDWALL - SEE D-PE-18A & D-PE-18B WITH 6:1 WINGWALL SLOPE
24" ENDWALL - SEE D-PE-24A & D-PE-24B WITH 6:1 WINGWALL SLOPE
30" ENDWALL - SEE D-PE-30A & D-PE-30B WITH 6:1 WINGWALL SLOPE
36" ENDWALL - SEE D-PE-36A & D-PE-36B WITH 6:1 WINGWALL SLOPE
42" ENDWALL - SEE D-PE-42A & D-PE-42B WITH 6:1 WINGWALL SLOPE
48" ENDWALL - SEE D-PE-48A & D-PE-48B WITH 6:1 WINGWALL SLOPE

(B) SIDE DRAIN CONCRETE ENDWALL REQUIRES STEEL PIPE GRATES SHOWN ON THIS DRAWING. THE CONTRACTOR SHALL OMIT THE CONCRETE BLOCKOUTS (4" x 7") AS SHOWN ON STANDARD DRAWING D-PE-99 SECTION D-D THRU WINGWALL AND SUBSTITUTE THE FOLLOWING REINFORCING BARS:

30" ENDWALL - SUBSTITUTE A465 & A466 BY EXTENDING A464 TO 19'-5"
36" ENDWALL - SUBSTITUTE A464 & A465 BY EXTENDING A463 TO 23'-0"
42" ENDWALL - SUBSTITUTE A465 (2 BARS), A466 & A467 BY EXTENDING A464 TO 26'-0"
48" ENDWALL - SUBSTITUTE A465 (2 BARS), A466 & A467 BY EXTENDING A464 TO 29'-7"

(C) THE MATERIALS, WELDING AND PAINTING FOR STRUCTURAL STEEL GRATE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:

1. ANGLES: ASTM A36
2. STEEL PIPE: ASTM A53 GRADE B, STANDARD WEIGHT (SW) OR ASTM A500 GRADE B AND SHALL BE GALVANIZED FOR 15" THRU 24" DIAMETER PIPE CULVERT. ASTM A53 GRADE B, DOUBLE EXTRA STRONG WEIGHT (XXS) - FOR 30" THRU 48" DIAMETER PIPE CULVERT.
3. WELDING: AASHTO/AWS D1.5M/D1.5 BRIDGE WELDING CODE (LATEST EDITION)
4. ALL STEEL GRATES SHALL BE GALVANIZED.
5. PIPES ARE TO BE VENTED PER GALVANIZATION REQUIREMENTS. HOLE SIZE AND LOCATIONS WILL BE DETERMINED BY GALVANIZER DURING THE APPLICATION.

THE MATERIAL AND GALVANIZING FOR BOLTS, NUTS AND WASHERS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:

1. BOLTS, NUTS AND WASHERS: ASTM F1554 GRADE 36
2. GALVANIZING: ASTM A153

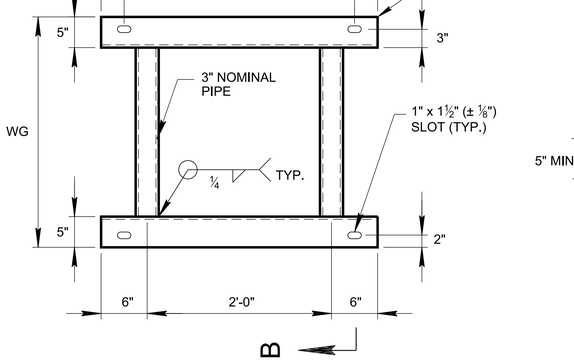
(D) THE COST OF FURNISHING BOLTS, NUTS AND WASHERS, INCLUDING ALL MATERIALS, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION, SHALL BE INCLUDED IN THE PRICE BID FOR STRUCTURAL STEEL.

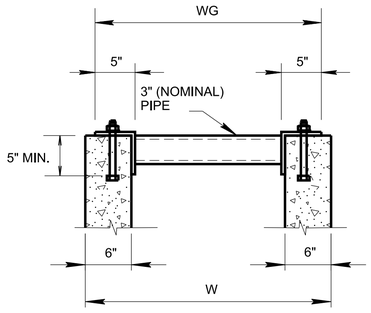
(E) PAYMENT WILL BE MADE UNDER ITEM NUMBERS:

611-07.30	15IN ENDWALL (SIDE DRAIN)	EACH
611-07.31	18IN ENDWALL (SIDE DRAIN)	EACH
611-07.32	24IN ENDWALL (SIDE DRAIN)	EACH
611-07.33	30IN ENDWALL (SIDE DRAIN)	EACH
611-07.34	36IN ENDWALL (SIDE DRAIN)	EACH
611-07.35	42IN ENDWALL (SIDE DRAIN)	EACH
611-07.36	48IN ENDWALL (SIDE DRAIN)	EACH

(F) THE CONTRACTOR MAY ELECT TO SUBSTITUTE AN APPROVED ALTERNATIVE DESIGN

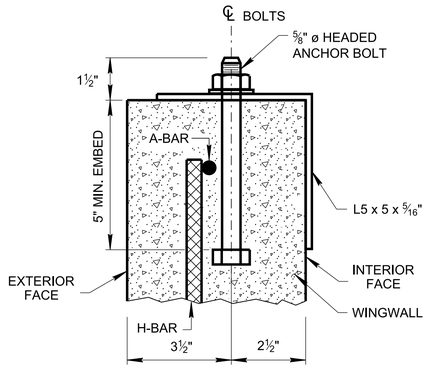
(G) DIMENSIONAL AND REINFORCING TOLERANCES WILL BE AS SHOWN IN STANDARD OPERATING PROCEDURE (SOP) 5-3.



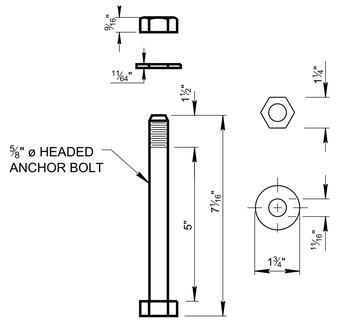


SECTION B-B
SHOWING ANCHOR BOLTS AND PARTIAL WINGWALLS

STEEL PIPE GRATE



ANCHOR BOLT ASSEMBLY



ANCHOR BOLT DETAIL

ALTERNATE ANCHORS FOR STRUCTURAL STEEL GRATES

CERTIFICATION:
DRILLED-IN EPOXY ANCHORS OR CAST-IN THREADED INSERTS MAY BE UTILIZED IN LIEU OF CAST-IN HEADED ANCHOR BOLTS PROVIDED THAT THE CONTRACTOR FURNISHES CERTIFIED ANCHOR PULL OUT DATA FROM AN INDEPENDENT TESTING LABORATORY USING CLASS "A" CONCRETE AS PRESCRIBED BY TENNESSEE HIGHWAY SPECIFICATIONS. THE REQUIRED ULTIMATE LOAD FOR ⅝" DIAMETER ANCHORS IS 10,000 POUNDS.

NOT TO SCALE

- REV. 7-10-12: REVISED ALTERNATE ANCHORS FOR STRUCTURAL STEEL GRATES NOTE.
- REV. 1-10-13: CHANGED REQUIREMENT FOR GRATE ON ALL ENDWALLS.
- REV. 6-14-13: REVISED NOTE (E), ADDED NOTES (F) AND (G).
- REV. 3-16-17: REVISED GENERAL NOTES. ADDED FOOTNOTE TO TABLE.
- REV. 06-28-19: RENAMED AND REDREW SHEET.
- REV. 10-16-20: REVISED SLOT DIMENSION, ADDED ANCHOR BOLT DETAIL AND REVISED 18" PIPE GRATE PLACEMENT DIMENSIONS.
- REV. 03-04-21: REVISED GENERAL NOTES (A) (B) AND (C2).
- REV. 10-29-21: ADDED GENERAL NOTE (C5)

- MINOR REVISION -- FHWA APPROVAL NOT REQUIRED

STATE OF TENNESSEE
STANDARD DRAWING
DEPARTMENT OF TRANSPORTATION

TYPE "SAFETY" SIDE DRAIN ENDWALL WITH STEEL PIPE GRATE, FOR 15" THRU 48" PIPES, 6:1 SLOPE

03-01-2012 | D-SEW-1A